CHEMICAL
& METALLURGICAL
ENGINEERING

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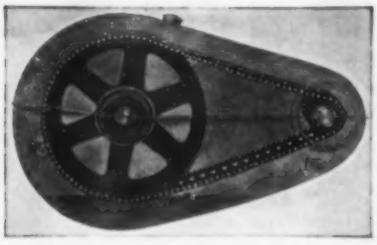

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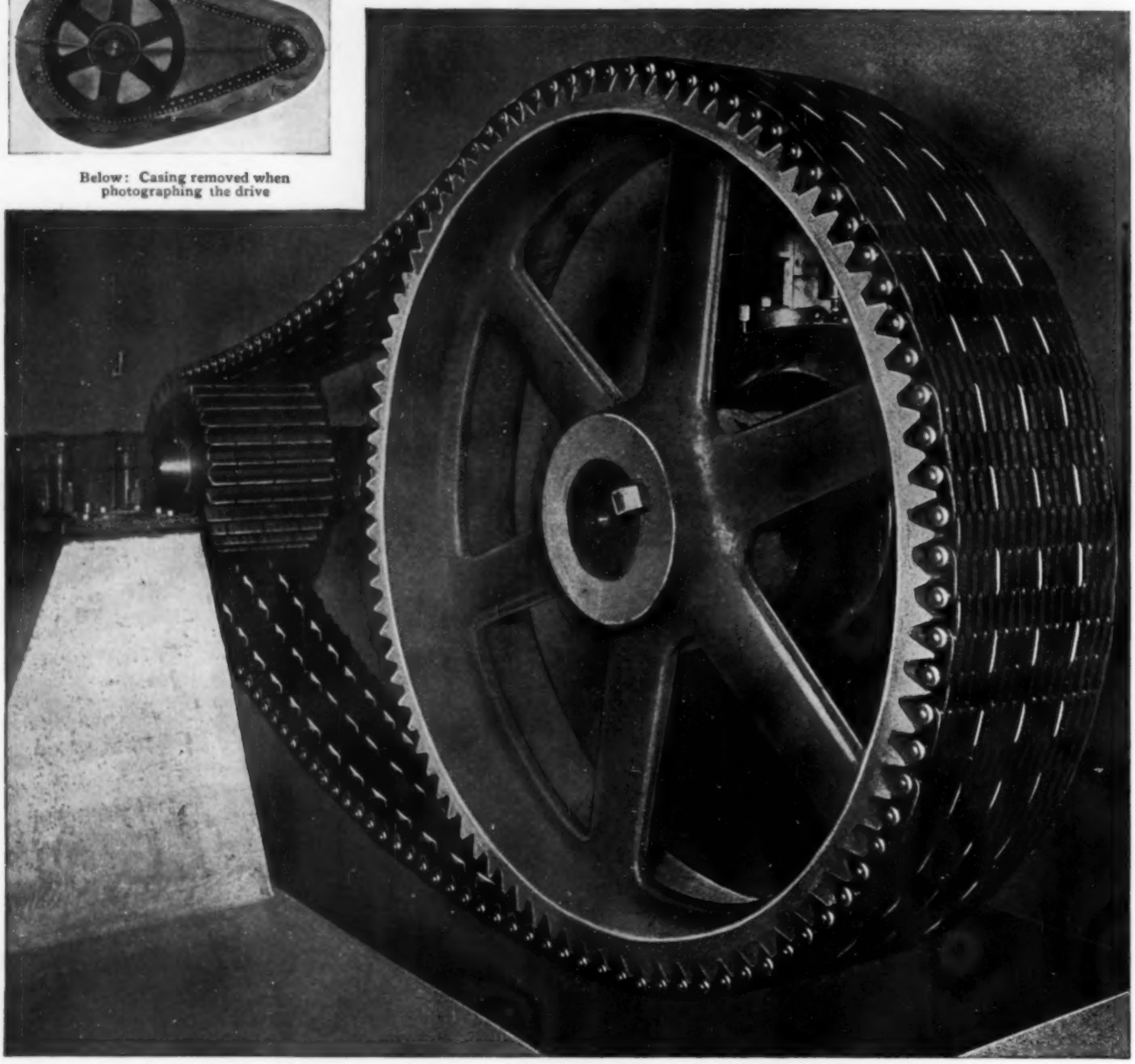

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CHEMICAL & METALLURGICAL ENGINEERING

VOLUME 42 .. ESTABLISHED 1902 NUMBER 11

McGRAW-HILL PUBLISHING COMPANY, INC.

S. D. KIRKPATRICK, Editor.

NOVEMBER, 1935

MAKE WAY FOR THE NEW

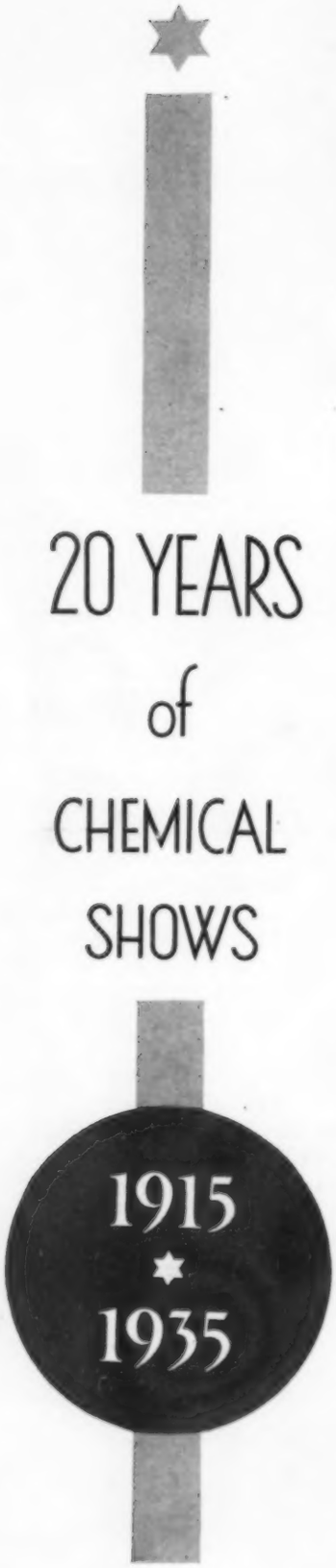
NO OBLIGATION is more pressing nor duty more insistent than the chemical engineer's own desire to keep up to date. His value to industry and to himself is measured by his knowledge of latest developments in theory and practice. His favorite field of study is the process of change. All about him he sees striking progress in translating new ideas into practical processes, in displacing old methods and machinery with new procedures and more efficient equipment. Allied with the research chemist in the laboratory and the salesmen in the field, the chemical engineer becomes a veritable champion of change. To him industry is looking for much of its further progress and profits.

How best can *Chem. & Met.* serve its readers in this important task of keeping abreast of the rapid changes that are taking place in chemical engineering practice? A steady flow month by month of news of processes and equipment is, of course, the first essential. But on occasions, such as the Chemical Exposition now presents biennially, it is worthwhile to take an inventory —to collect, interpret and appraise the value of these developments. The Exposition itself offers an extremely effective means to study firsthand the great variety of improvements that have been made during the past two productive years. The preview which it is our privilege to present in this issue is convincing proof that this progress has been real and worthwhile.

Another measure of the recent activity and ingenuity of the chemical engineer is to be seen in the impressive array of new processes and products that have been developed since 1933. A new series of flowsheets for almost forty new processes should prove a welcome addition to any chemical engineering file. And tabulated for ready reference by name, composition and manufacturer, are more than 400 new materials produced during the last few years by process industries. More evidence of creative ability!

But of all the chemical engineer's accomplishments, the one that most typifies this whole constructive philosophy of change is the contribution of the company which wins the biennial Award for Chemical Engineering Achievement. The dramatic story of the successful development in this country of large-scale production of synthetic rubber, synthetic camphor and a variety of other essential organic chemicals is one to which the chemical engineer can point with justifiable pride.

All of these elements that go to make up this Fifteenth Chemical Exposition number of *Chem. & Met.* have in common one important quality: They are NEW. As such, they are respectfully offered as our contribution to the task to which chemical engineering is dedicated:— Constantly to push forward with confidence that the old will make way for the new when it is backed by good technology and sound economics.



THINK back, if you will, to 20 years ago, when, in the week of September 20, 1915, the first Exposition of Chemical Industries bravely opened the doors of the Grand Central Palace in New York. Those were trying days, in more ways than one. Cut off by the German blockade, consumers of dyestuffs and textile chemicals were trying frantically to locate new sources of supply. Hospitals and clinical laboratories were trying to find substitutes for essential pharmaceuticals. The Allies were beginning to look to America for their rapidly mounting requirements for munitions. American chemists and chemical engineers were being sorely tried, because theirs was the almost impossible task of building up, practically overnight, the basic chemical industries that had been slowly developed abroad over a half century. Nowhere could one turn to find all of the necessary raw materials and equipment so badly needed.

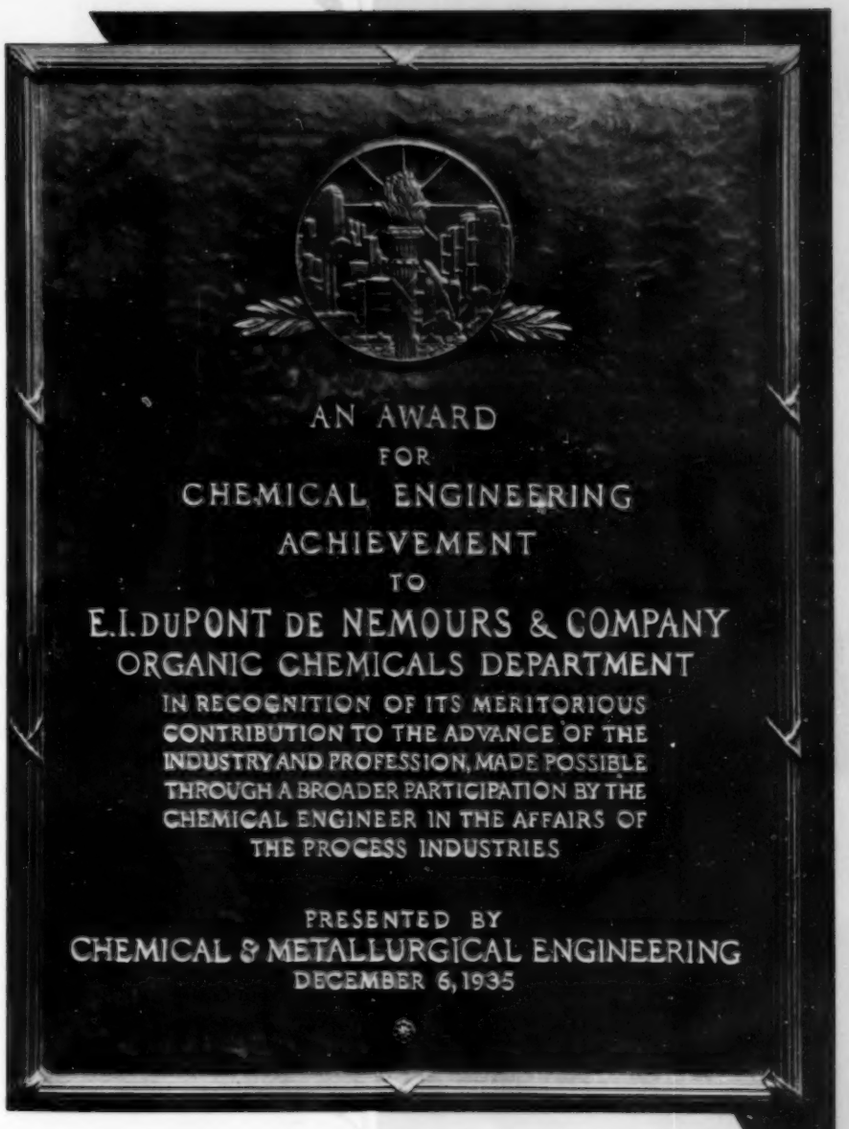
To fill such a need, the first Chemical Exposition served an extremely useful purpose. It not only dramatized our progress but brought together for the first time the combination of men, materials and machinery that was essential to further advance. And it was truly prophetic of what that advance was to be, for its broad sweep of interests pointed out the diversity of ways in which chemistry and chemical engineering were to serve the nation's needs.

In five following years each succeeding Chemical Exposition surpassed its predecessor in stimulating popular interest in these war-born industries. Chemistry was sold—perhaps even oversold—to a public that had had its imagination fired by spectacular growth and development. Then came the questioning days of 1921 when the glamor of war and the post-war boom had given way to depression. This was a period of tearing down and casting aside that which had been ineffective and inefficient. Again American chemical engineering was challenged, but to defend rather than attack. We had to prove that we could build, profitably and substantially.

Quick to see its opportunity and responsibility in this rebuilding process, the management of the Chemical Exposition radically changed its entire purpose and program. It, too, cut out non-essentials. No longer was there any need for popular appeal. In its place came the more practical and useful means of encouraging interest on the part of the thousands of chemists, engineers and industrialists whose production problems were only to be solved by improved machinery and materials. On this more substantial basis, the Chemical Exposition grew in importance and influence, playing a major rôle in developing a group of progressive industries in which there has been the liveliest flow of new technology and interchange of practical knowledge and experience.

That program and purpose proved itself sound, even in the face of the five years of depression from which we are now emerging. There has been no recession in the production of new ideas and products: in fact the opposite has been the case. The process industries have fared better than others, primarily because they have capitalized on this profitable philosophy of change, the physical manifestations of which we have come to associate with the "Chem. Show."

Twenty years of steady progress: Five in building public recognition and support, five in tearing down and rebuilding chemical industry on a more substantial basis, five more in strengthening and developing its technical and industrial resources and a final five in fighting and conquering the depression, in the only way it could be conquered, namely, with new processes and new machinery to produce new and better goods at lower and lower costs. This is the record on which the Chemical Exposition proudly stands and confidently faces the future. Our congratulations! And with them the good wishes of the chemical industry and profession for another 20 years of just as constructive service.



INDIVIDUAL EFFORT and accomplishment of outstanding merit in chemical industry has long been recognized by a multiplicity of medals, awards and personal honors. But no comparable recognition of group effort had been made prior to the establishment in 1933 by *Chemical & Metallurgical Engineering* of this Award for Chemical Engineering Achievement. Its primary purpose has been to stimulate a broader participation of chemical engineers in the affairs of industry by honoring that company which, in the opinion of a representative Committee of Award, has contributed most to the advance of chemical industry and of the chemical engineering profession. Of industrial achievements in this field which have come to fruition during the past two years, that of the Organic Chemicals Department of E. I. duPont de Nemours & Co. has been judged the most meritorious. As described in the following article, this is a major accomplishment of which the chemical engineering profession is justly proud.

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TOWER OF LIGHT SIGNALIZING CONTINUOUS PRODUCTION OF DUPRENE

WHAT RESEARCH

ACHIEVEMENT as the result of group effort on the part of a corporate organization is the basis for this story. It is a remarkable record of coöperation and teamwork in a great program of industrial development that affects the lives and work of millions of Americans. In short, it is the creation in this country of a vital industry that supplies essential organic chemicals on which nearly every other industry of the world is becoming increasingly dependent. "Better things, for better living, through chemistry" is something more than a catchy slogan of E. I. duPont de Nemours & Co. It is a business creed that has molded and guided the work of thousands of chemists, engineers and industrialists.

To assign major credit for the duPont achievement to any individual or groups within the entire organization would be patently unfair. Each and all—research, engineering, production, sales, management, and administration—have contributed. But because chemical engineering and chemical engineers have participated so broadly and effectively throughout all of the affairs of the Organic Chemicals Department of the duPont company, it is appropriate that this article should be concerned primarily with that contribution. It is one that stirs the imagination and pride of the entire chemical engineering profession.

In the opinion of the distinguished committee of award, the outstanding chemical engineering achievement to reach fruition during the past two years has been the successful industrial development of the synthetic rubber, DuPrene, of synthetic camphor and of certain other important organic chemicals and dyestuffs. Back of these more recent and specific accomplishments lies the major achievement of the past two decades in building a great organic chemicals industry. The importance of that development from the standpoint of national security, economic independence, and the public welfare needs no repetition to the readers of these pages. But let us here consider these ventures from the practical points of view of the chemical engineer and business man. Unless industrial development can be organized and carried on at a profit that will assure an eventual return to those who have furnished the capital to make such ventures possible, nothing of lasting value can be achieved. The development of DuPrene is a case in point.

Research on synthetic rubber was started in the Organic Chemical Department of the duPont company about ten years ago, because the duPont management had faith in the ability of its chemists to produce a synthetic rubber that would be at least equal to the natural product, if given sufficient time and the necessary financial support. This faith they held in spite of the fact that years of intensive research by many of the world's most distinguished chemists had so far failed to show that the chemical laboratory could equal Nature as a rubber producer.

Acetylene seemed to be the most desirable raw material because of its reactivity and its potential availability in unlimited quantities. The first step appeared to be to cause two molecules of acetylene to react so as to produce an unsaturated compound having four carbon atoms in a straight chain. This was accomplished but the process proved to be a difficult one and the yields were disappointingly low. At this point the duPont chemists learned of the work of Father J. A. Nieuwland of the University of Notre Dame, who had found a catalyst consisting essentially of a satur-

by SIDNEY D. KIRKPATRICK
EDITOR, *Chemical & Metallurgical Engineering*

CREATES .... CHEMICAL ENGINEERING ACHIEVES

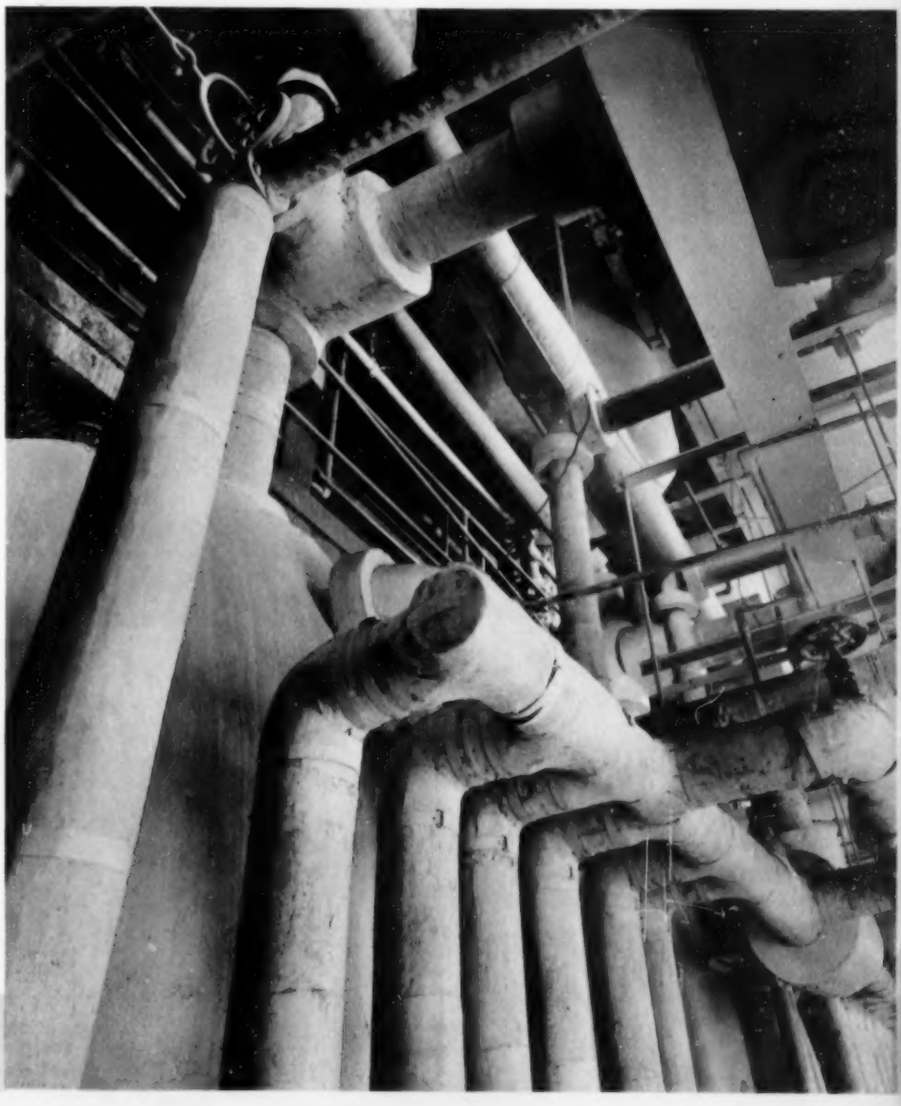
ated solution of cuprous chloride and ammonium chloride and water, with which it was possible to polymerize acetylene to divinylacetylene, an unsaturated compound having six carbon atoms in a straight chain.

It was found that the partial polymerization of this hydrocarbon produced a synthetic drying oil, "S.D.O." which, when applied on wood, metals or concrete, quickly hardens to produce a surface film that is highly resistant to practically all chemicals and solvents. Many uses for "S.D.O." have been found in the chemical and other industries, where equipment must be protected against corrosive liquids and vapors which ordinary paints, varnishes and lacquers will not resist.

Attempts to produce a satisfactory synthetic rubber by polymerizing divinylacetylene were unsuccessful, but it was soon learned that the conditions under which acetylene is exposed to the catalyst could be modified so as to produce chiefly monovinylacetylene. It did not prove to be possible to make a synthetic rubber of high quality by polymerizing monovinylacetylene but duPont research chemists further discovered that monovinylacetylene could be converted to chloroprene (chloro-2-butadiene-1, 3) by treating it with hydrogen chloride in the presence of a catalyst and that chloroprene polymerized readily to produce a synthetic rubber of very high quality.

On the promising basis of this laboratory research, the decision was made for further experimental development. This decision was of more than usual importance for a number of reasons of primary interest to the chemical engineer and industrialist. Ordinarily the process would have next been tried out in small-scale or semi-works equipment, before finally expanding it to plant scale operation. However, these acetylene reactions required the handling of gaseous raw materials, of relatively large volume per unit of weight, which made it necessary to install large-sized equipment in order to produce even experimental quantities.

In the operation of the catalytic process for converting acetylene to monovinylacetylene, it is



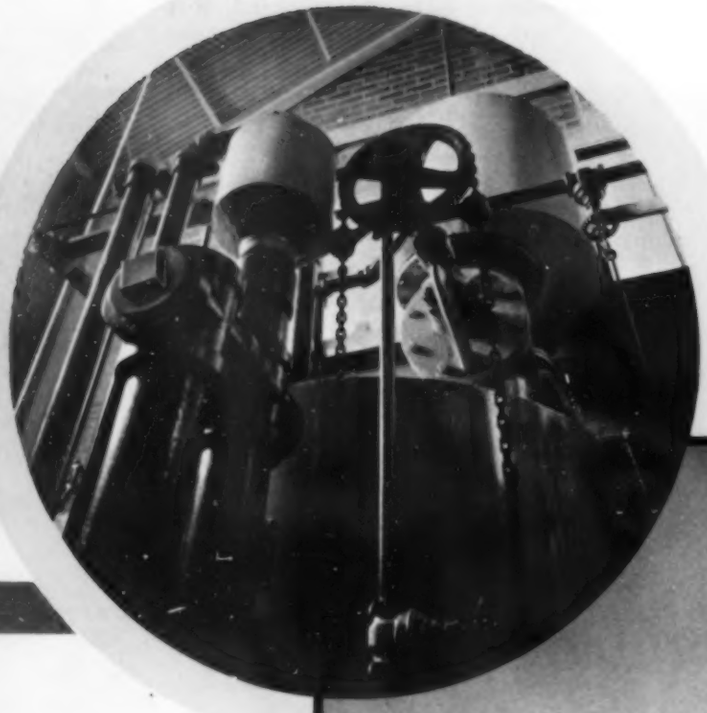
THROUGH THIS MAZE OF PIPING, ACETYLENE FINDS ITS WAY TOWARDS SYNTHETIC RUBBER

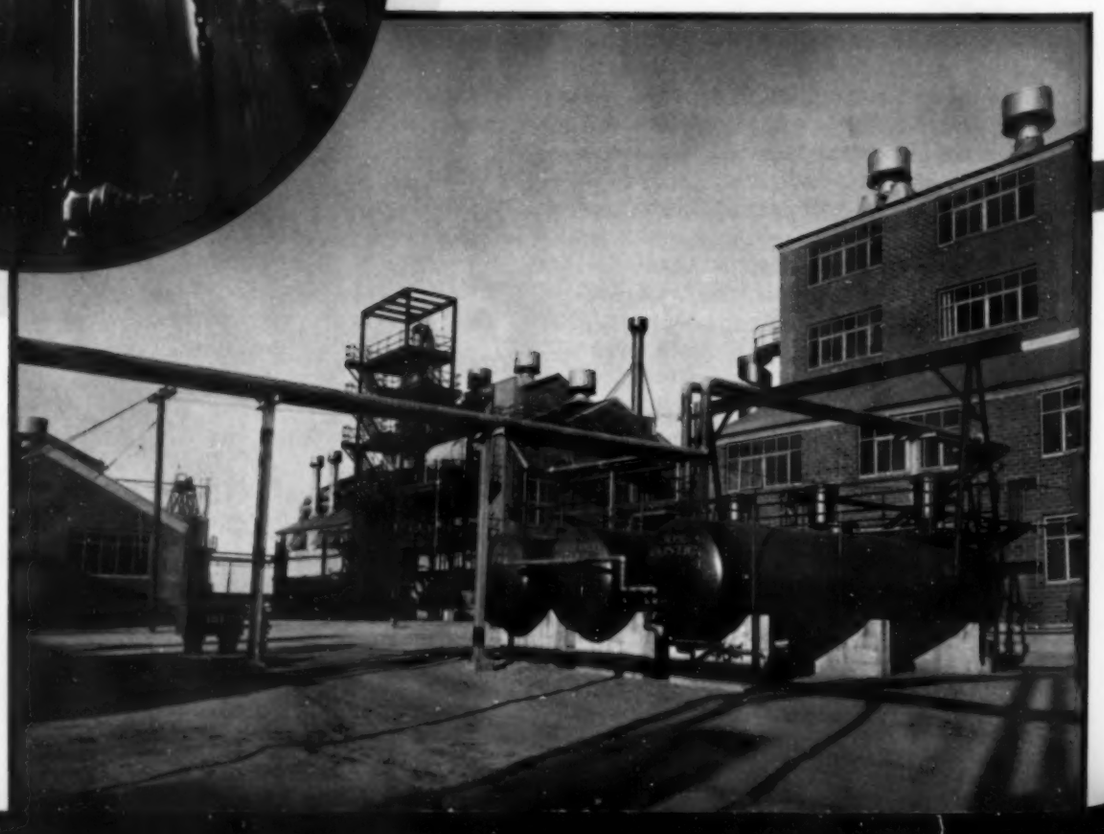
necessary that the latter product be removed from the catalyst as soon as it is formed; otherwise, the reaction will continue with the production of divinylacetylene. Accordingly, the gas is rapidly swept through the catalyst and, through condensation and fractional distillation, the monovinylacetylene is separated from the unconverted acetylene and from the divinylacetylene and other byproducts which are formed in substantial quantities, even under the most favorable operating conditions. This separation requires cooling the gas stream to about 70 degrees below zero Centigrade, which necessitated the design of a refrigeration system for which there was no precedent. Again, it was apparent that conclusive data for equipment design could only be obtained from an installation approximating large-scale production.

In the conversion of monovinylacetylene to chloroprene similar conditions were encountered, because chloroprene, which is formed by the addition of hydrogen chloride to monovinylacetylene, reacts readily with a second mol of HCl to form dichlorobutene. So again it was necessary to sweep the gases rapidly through the catalyst and promptly separate the reaction products. Moreover, chloroprene begins to polymerize as soon as it is formed. The polymer that accumulates in the processing equipment and pipe lines not only represents a loss of yield but makes it necessary to design the equipment so that the polymer can be removed and destroyed.

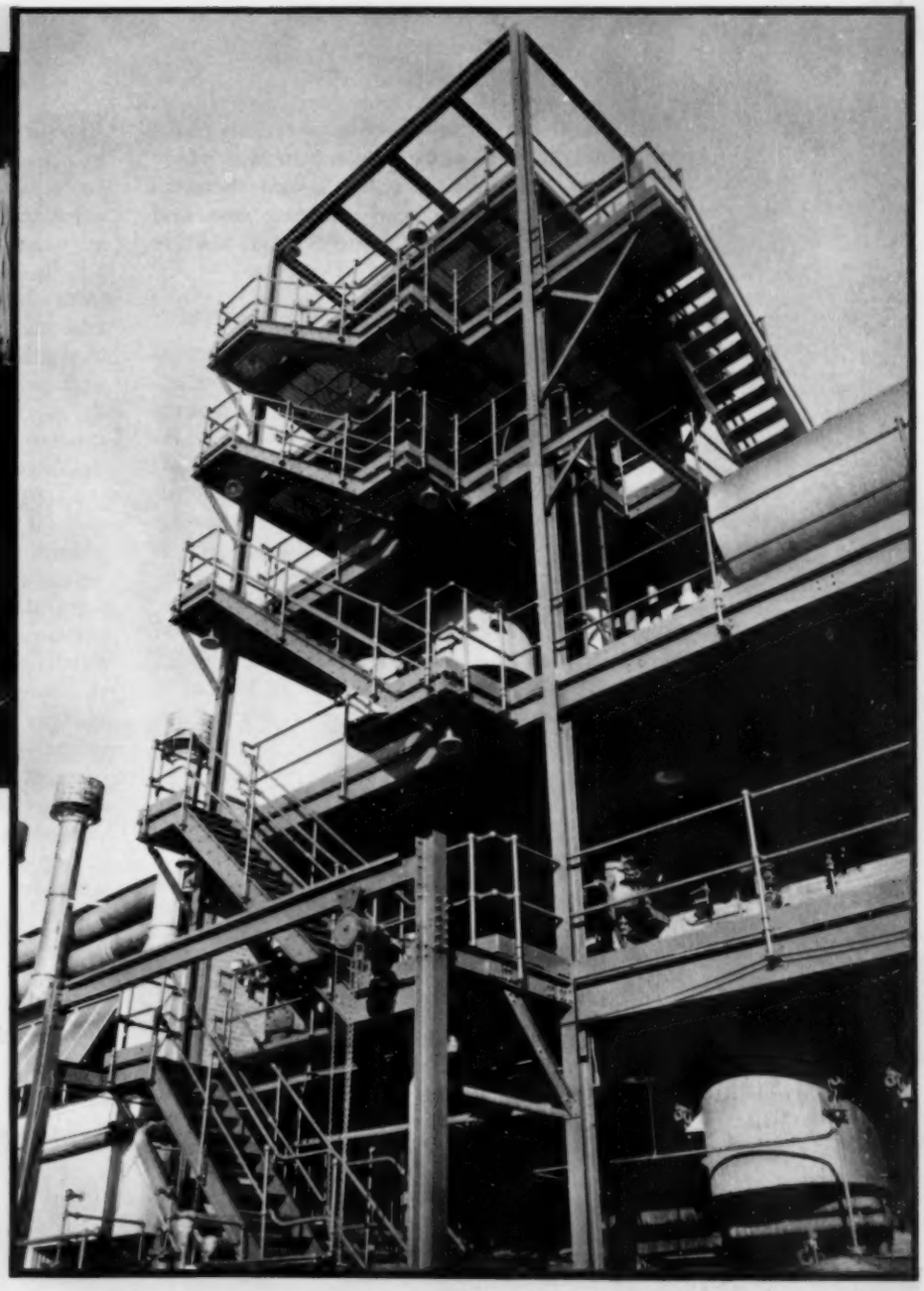
Facing these facts during the depressing days of 1931, a less courageous management might have hesitated to plunge almost directly into such a large-scale operation. Yet good chemical engineering judgment dictated that course and the pilot plant was erected. In the first three years it has served its purpose extremely well. It has been the scene of almost constant change in design and construction as many pressing problems have had to be solved through chemical research and chemical engineering development. The commercial production of synthetic rubber from acetylene would never have been possible if these problems had not been met and solved on the spot. Likewise, it is a tribute to modern chemical engineering that this production would have been impossible had it not been for the comparatively recent development of new corrosion-resistant alloys and superior glass-lined equipment.

This large-scale pilot plant served another useful purpose in that its output over a three-year period of almost a half million pounds of DuPrene has provided rubber manufacturers with sufficient material to permit them to carry on large-scale experimentation in its many interesting uses. As a matter of fact, a number of important commercial applications were soon found and their growing requirements for DuPrene very soon overtaxed the capacity of the original plant. Accordingly, the decision was made in 1934 to build a new





FROM AUTOMATIC CARBIDE GENERATORS, ABOVE, HOUSED IN BUILDING AT LEFT, COMES THE CHIEF RAW MATERIAL, ACETYLENE. THE OTHERS ARE CHLORINE, CAUSTIC SODA, ALCOHOL AND WATER



TO MAKE ALMOST A HUNDRED THOUSAND POUNDS A MONTH OF SOLID RUBBER REQUIRES THE HANDLING OF VAST QUANTITIES OF GASEOUS RAW MATERIALS OF RELATIVELY LARGE VOLUME PER UNIT OF WEIGHT

plant, which is now in commercial production. This new plant is now producing at the rate of approximately 1,000,000 pounds per year of synthetic rubber.

The value of this outstanding achievement can best be measured by comparing the properties of DuPrene with those of natural rubber. Of all the differences between DuPrene and natural rubber, the one that is most striking to the layman is its greatly improved resistance to the deteriorating effect of crude oil, refined petroleum products, coal-tar solvents, animal and vegetable oils and the other oily materials which cause natural rubber to swell and disintegrate. As a result of its oil resistance, the new product has found important applications in the manufacture of gaskets, packings, valve diaphragms, pump pistons and sealing rings. For the same reasons it is used as the lining of hose for conveying all types of oils and solvents used in the industries.

Although the oil resistance of DuPrene may be its most striking property from a layman's point of view, the fact that it withstands heat better than natural rubber appears to be of greater commercial importance. Because of this property, it is used in power transmission belts, steam packing, spinning discs for glass blowing, and many other articles which require a tough, resilient rubbery material that is less affected by heat and less inflammable than is the case with the natural product.

Every one knows that rubber tends to check or develop cracks when exposed to sunlight or when repeatedly flexed, even in the absence of sunlight. The synthetic product is greatly superior to rubber in these respects, which again opens many uses to it. Likewise, its resistance to acids and alkalis makes it useful in the construction of chemical equipment and for the manufacture of gloves and aprons to protect workmen who must handle chemicals that are destructive to rubber and

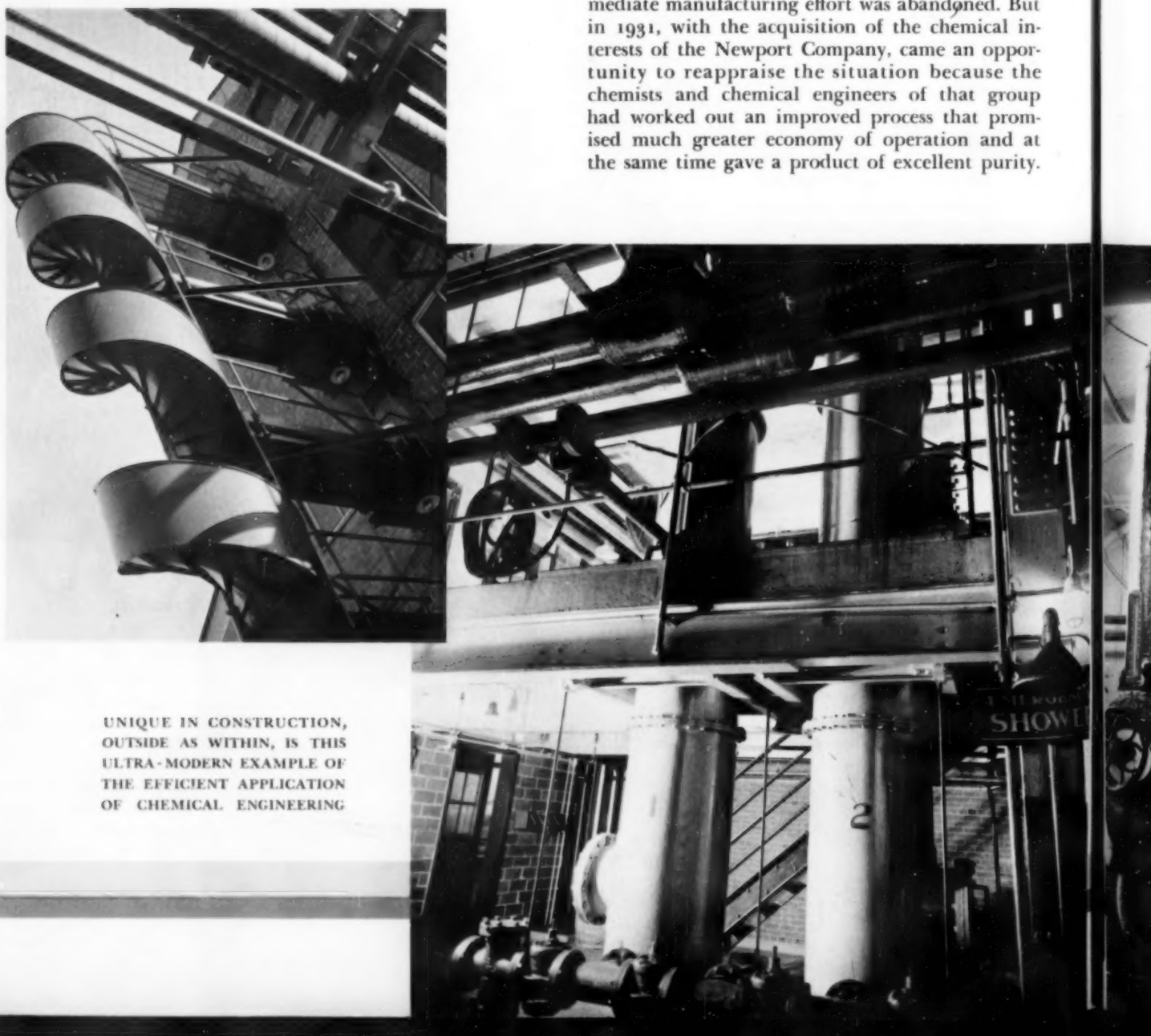
to the human skin. Many other applications could be cited but these are more than sufficient to prove the point, namely, that if research and chemical engineering development can create a new and superior material, there is a preferential market waiting for it, even at a higher price.

SYNTHETIC CAMPHOR FROM TURPENTINE

Behind synthetic camphor is an even more interesting story of years of research and development, finally culminating in successful large-scale production from American turpentine. Few industrial fields have proved more attractive for organic chemical research. Raw material has always been available in abundance. The largest market in the world for the finished product is within our borders. The only source of supply of the natural product is the island of Formosa. It is not surprising, therefore, that there should have been a number of attempts to synthesize camphor in this country. The surprise is that it has not been done successfully prior to the duPont achievement.

As much as $3,000,000 had probably been spent by various American companies in research and large scale development on synthetic camphor prior to the building of the present plant. European processes have been tried out in this country, but without success, presumably because they were dependent upon a large amount of labor and manual control. The fundamental chemistry of synthetic camphor from pinene had been fairly well worked out over the past three decades, but again the problem lay in translating laboratory processes into manufacturing methods adapted to American conditions.

In 1918 and 1920, at a time when the price of natural camphor had risen from 40 cents to $1.36 a pound, the duPont company was encouraged to enter the manufacture of a synthetic product. A plant was built at the Deepwater (N.J.) dye works to apply a process not greatly different from that used today. As first worked out, that process had some shortcomings both in the high cost of operation and the impure quality of finished products. These might well have been overcome, however, but the price of imported natural camphor fell from $1.36 a pound in 1920 to $0.59 in 1921 so that the immediate manufacturing effort was abandoned. But in 1931, with the acquisition of the chemical interests of the Newport Company, came an opportunity to reappraise the situation because the chemists and chemical engineers of that group had worked out an improved process that promised much greater economy of operation and at the same time gave a product of excellent purity.



UNIQUE IN CONSTRUCTION, OUTSIDE AS WITHIN, IS THIS ULTRA-MODERN EXAMPLE OF THE EFFICIENT APPLICATION OF CHEMICAL ENGINEERING

So in 1932, again in the trough of the depression, and in spite of the fact that by this time the price of crude camphor had been reduced to $0.285, it was decided to go ahead with the construction of a large new plant at Deepwater, N.J. When completed, and in successful operation early in 1934, this new plant had an annual capacity of 1,500,000 pounds.

American synthetic camphor is a highly refined product, definitely superior to the synthetic material imported from abroad. The extent to which it has been accepted by American industry and is replacing the natural camphor in the manufacture of pyroxylin plastics, films, and safety glass, is now a matter of official record in Washington.

DYESTUFFS . . . PARENT INDUSTRY

Although DuPrene and synthetic camphor well serve to dramatize the recent achievements of this resourceful and productive group, they are but typical of what has been accomplished by the Organic Chemicals Department during the past twenty years. They are in a sense the natural results of the building up of a vast fund of knowledge and experience in the solving of complicated chemical and chemical engineering problems. Today this is probably the greatest asset of the industry and the one that holds most promise for the future. It is the common bond that ties together such apparently unrelated activities as the manufacture of tetraethyl lead and dyestuffs, fluorine derivatives for refrigerants and anti-oxidants for rubber, gum inhibitors for gasoline and or-

TWO STEPS IN THE FINAL STAGES OF WASHING AND MILLING SYNTHETIC RUBBER ARE SHOWN DIRECTLY ABOVE

•

NOWHERE WAS THERE A PRECEDENT ON WHICH TO BASE THE DESIGN OF THIS HUGE REFRIGERATING UNIT THAT MUST DELIVER BRINE AT A SERIES OF TEMPERATURES RANGING FROM 15 TO 70 DEGREES BELOW O CENTIGRADE

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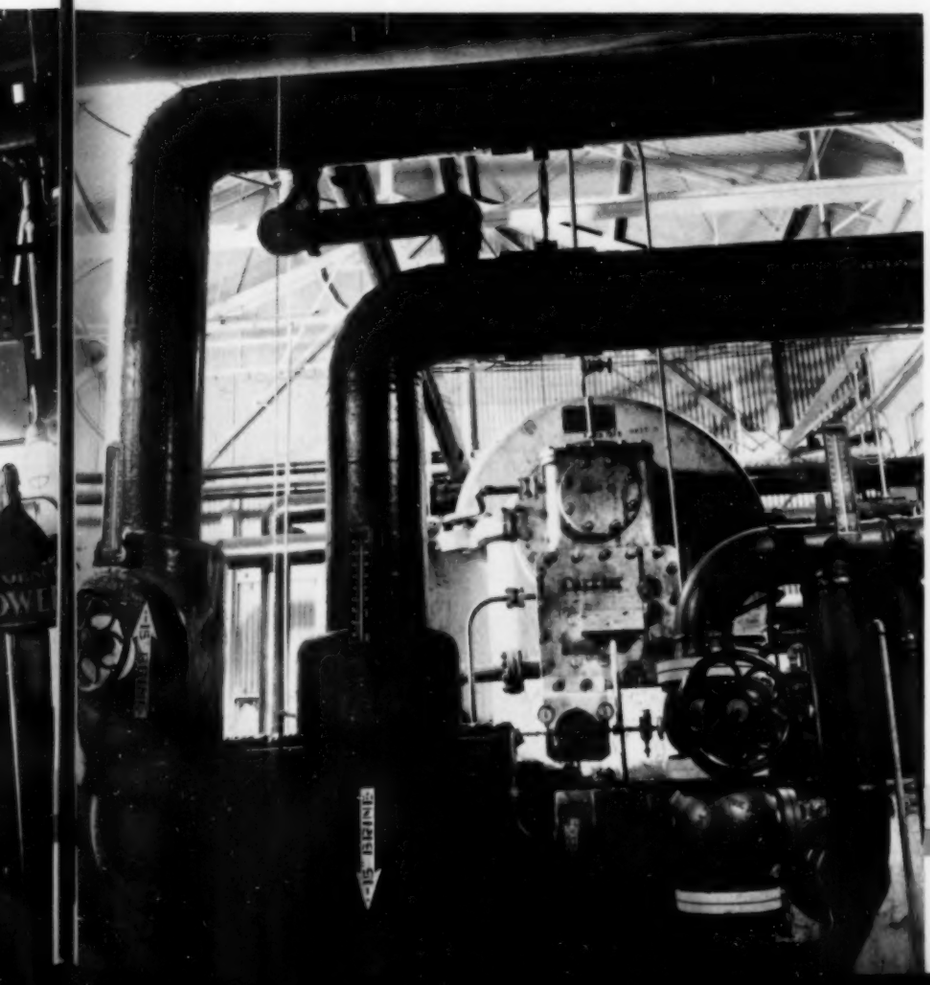


FROM DOMESTIC TURPENTINE, AMERICAN CHEMICAL ENGINEERING PRODUCES . . .

ganic mercurials for seed disinfection and the preservation of lumber. It is worth while, therefore, to look back to the origin of the parent development and briefly to trace its progress during the past twenty years of steady growth.

As long ago as 1907 the duPont company had been engaged in the manufacture or organic chemicals. Nitrocellulose, nitroglycerine, dinitrotoluol and later, trinitrotoluol, were well established products of the high explosives industry long before the World War. Diphenylamine, used as a stabilizer for smokeless powder, was among the first synthetic organic chemicals to be made by this industry. With the beginning of the World War, picric acid assumed greater importance and duPont chemists turned their attention to other chlorbenzol derivatives. From this work came the production of sulphur black, the first dyestuff to be made at Deepwater Point almost exactly twenty years ago.

The German blockade shortly thereafter resulted in urgent demands that led to the formation in 1917 of the Dyestuffs Department of the duPont company. With the acquisition of the chemical business of the Newport Company in August, 1931, the name was changed to the Organic Chemicals Department and it now includes the duPont interests in the Bayer-Semesan Company, organized in 1928, the Kinetic Chemicals, Inc., organized in 1930 and the Eastern Alcohol Company which was merged into the department in 1934.

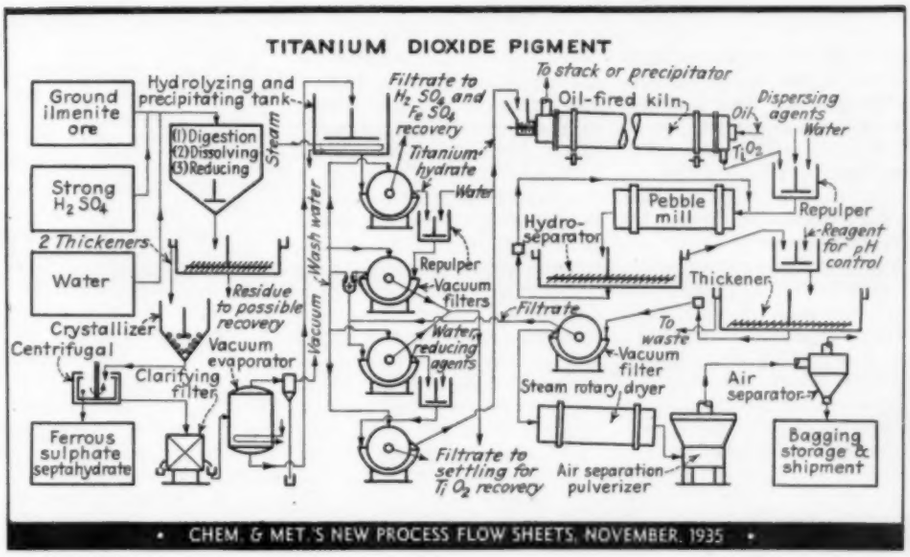
To trace the history of the hundreds of chemical products that have come from this department during the past two decades is obviously impossible here. Dyestuffs have grown in greatest profusion but the pattern in that growth is now becoming more and more apparent. There have been improvements in quality and fastness of color as the demand has come for better methods of textile finishing. From a chemical engineering viewpoint, it is significant that in the past 15 years the average sales price of dyestuffs of domestic production has gradually declined from over $1 a pound in 1920 to a level of about 45 cents in 1935.

Anti-oxidants and accelerators for rubber, gum inhibitors, stabilizers, and oil-soluble dyes for petroleum, solvents for lacquers and plastics, plasticizers, newer textile chemicals, wetting-out agents, and the newer "soapless detergents" (long-chain alkyl sulphates)—all these and many more materials are part of the daily production of the Organic Chemicals Department of E. I. duPont de Nemours & Co. It may be truthfully said that no other industry contributes such a variety of essential products that enter into the daily life and work of the entire nation.

. . . HIGHLY REFINED SYNTHETIC CAMPHOR WHICH IS FAST REPLACING THE FOREIGN PRODUCT

Chem. & Met's NEW PROCESSES AND FLOW SHEETS

Whatever is new holds the limelight in this November issue of "Chem. & Met." New processes to the number of 42, with 32 of them illustrated by flow sheets, are covered in the following 16 pages. In several cases, information is so closely held that very few details are to be had. In others, where flow sheets are included, a word of warning is in order: Although it is believed that the diagrams are reasonably accurate, in some cases guesses have been necessary; additionally, the charts are schematic and suggestive, not to be taken as actual layouts of equipment.



TITANIUM DIOXIDE

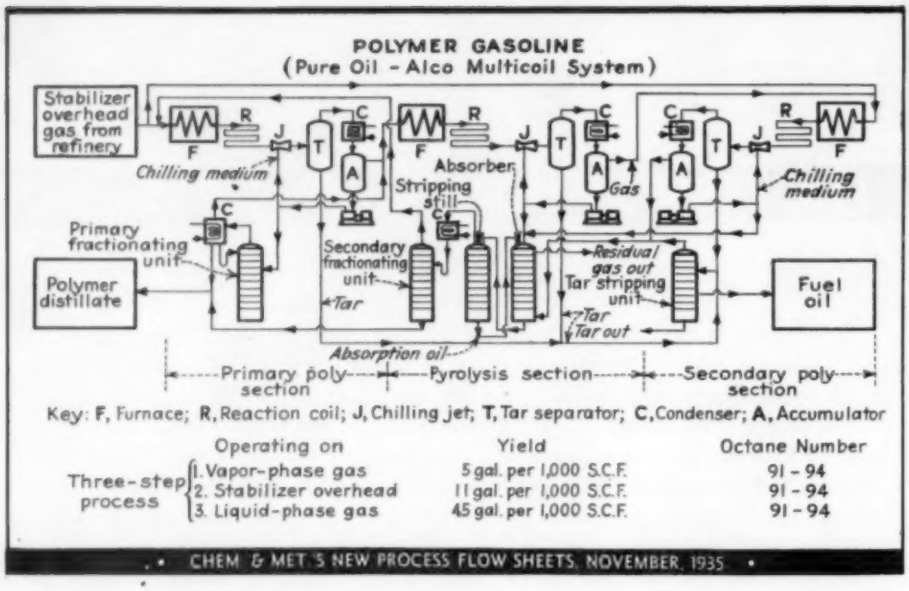
PROCESS for production of titanium dioxide from ilmenite; installed at plants of several pigment manufacturers.

Three principal raw-material sources, two foreign and one domestic. Most extensively used is that from Travancore, India, a beach sand ilmenite of 50 to 55 per cent TiO_2 content. Use of Norwegian ore concentrates carrying somewhat lower TiO_2, i.e., 42-43 per cent rapidly expanding. Minor sources are Island of Ceylon and Senegal. Nelsonite comes from Nelson County, Va. Is a composite ore, a pepper-salt mixture, of apatite and ilmenite. Latter constituent is magnetic and readily separable magnetically. Apatite becomes unusually desirable source of food product phosphate by sulphuric acid process. Ilmenite concentrates carry 42-43 per cent TiO_2 enrichable to 48-50 by acid leaching.

Several methods of bringing titanium values into solution under development but only one now practically demonstrated and applied. Finely ground ilmenite concentrates digested with strong sulphuric acid, going through pasty stage into comparatively dry mass; resembles method of making superphosphate. Mass dissolved in water under carefully controlled conditions of temperature and concentration while dissolving. Technique, subject to several minor modifications, important in terms of final pigment qualities.

This solution of iron and titanium sulphates is treated to assure reduced condition of iron sulphate, clarified and some ferrous sulphate crystallized out to leave definite $FeO:TiO_2$ ratio in solution. Solution reclarified to exacting brilliance, then vacuum concentrated to approximately double dissolved titanium content. By heating this solution under suitable carefully controlled conditions of relative concentration, temperature, etc., hydrated titanium precipitate forms. Latter filtered or settled from mother liquor of sulphuric acid and ferrous sulphate, washed by repeated filtration and repulping with water, keeping occluded ferrous sulphate in reduced condition until pulp practically iron free.

Washed filter cake then dried and calcined in long rotary kiln at slightly below 900 deg. C. Sometimes small amount of anti-sintering reagents added. Calcined material pulped with iron-free water, suitably dispersed, and elutriated in closed wet-dispersing circuit. Elutriator (hydroseparator) overflow suitably treated with reagents to secure pH desired in finished pigment and coagulate solids for thickening, filtration, drying, and final dry dispersion by micro-grinding under pressure —shear conditions as provided by certain types of rolls. Latter processing has considerable bearing on uniformity of desired oil absorption value of pigment. Pigment packed in units of 50 lb. in usual pigment paper bags. Uniquely valuable qualities well known, particularly in terms of inertness, whiteness and stability. Especially noteworthy for opacity, hiding power and tinting strength resulting from high index of refraction which indicates Anatase form of titanium oxide.



POLYMER GASOLINE

PROCESS for producing high-octane motor fuel from normally gaseous hydrocarbons. Can also produce pure benzol, toluol and related aromatics. Developed by chemists and engineers of Pure Oil Co. and Alco Products, Inc. First installed at former's Toledo refinery. Other commercial plants in operation in U. S. and foreign countries.

Three types of plants have been built: (1) Using refinery still gases as raw material; (2) using a concentrated liquid feed of unsaturated hydrocarbons; (3) using any refinery or natural gas, passing first through polymerization step, then through gas pyrolysis unit and finally through second polymerization step. Flow sheet shows latter process, known as multi-coil system.

In multi-coil system, refinery gases from either low-pressure system or in form of stabilizer overhead heated to 900-1,000 deg. F. under pressure of 600-800 lb. in pipe-coil heater and then passed to reaction zone where exothermic heat of reaction controlled. Polymerization of unsaturated hydrocarbons takes place. Gases and vapors chilled and rectified. Liquids boiling in gasoline range obtained and after treating for stability, are used as motor fuel or blending agents. Octane value, 78 to 85 (A.S.T.M. motor method). Gases from first polymerization step charged to gas pyrolysis unit, consisting of pipe-coil heater in which saturated hydrocarbons dehydrogenated. After chilling, gases rectified and unsaturated gases charged to final polymerization step. After heating to 1,100-1,300 deg. F., and reaction, vapors and gases chilled and rectified. Motor fuel liquid of 100-105 octane rating obtained for use as such or as concentrated blending agent. Composition: about 95 per cent aromatic and 5 per cent cyclic hydrocarbons. This material treated with 4 lb. sulphuric acid per barrel and fractionated yields pure benzol, toluol, and other aromatic hydrocarbons. Fixed gas resulting from two-step process contains over 40 per cent hydrogen; hence this byproduct suitable raw material for synthetic ammonia.

Multi-coil system has maximum flexibility inasmuch as primary polymerization step produces high vapor-pressure liquid and second polymerization step yields low vapor-pressure liquid. Hence refiner can blend for both volatility and octane rating desired in finished product. Higher yields as shown on data sheet are obtained, particularly because gas pyrolysis unit produces more unsaturated hydrocarbons for final polymerization. Estimated that polymer gasoline can be produced in U. S. under present conditions at cost not exceeding 5 cents per gallon. (See complete paper, "The Thermal Process for Polymerizing Olefin-Bearing Gases," by M. B. Cooke, H. R. Swanson and C. R. Wagner, presented before American Petroleum Institute, Los Angeles, Nov. 14, 1935.)

ALZAK PROCESS

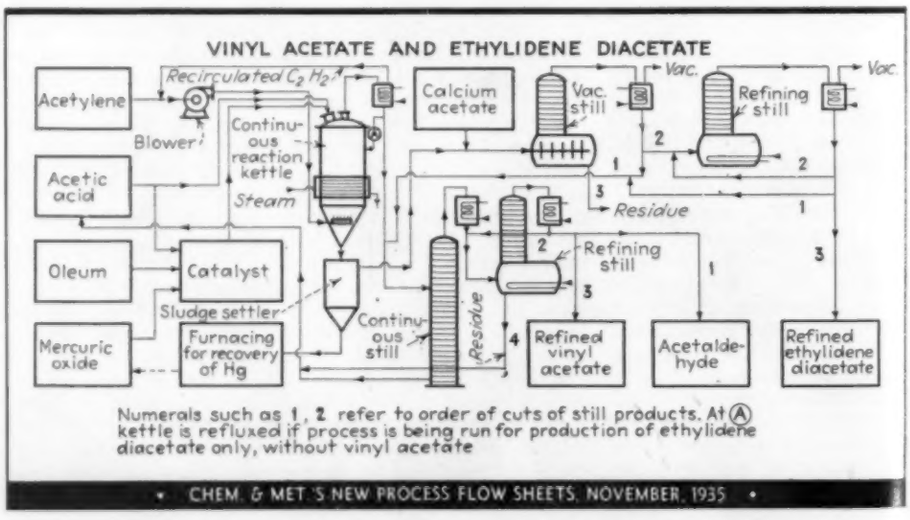
ELECTROLYTIC process for making non-tarnishing and weather resistant aluminum reflectors of about 80 per cent reflectivity, developed by Aluminum Co. of America.

Shaped aluminum reflector, etched or polished, depending on whether diffusing or specular surface desired, it is electrolytically brightened, and given transparent protective oxide coating by Alumilite process. Electrolytic brightening is anodic treatment in electrolyte which cleans and brightens surface without destroying finish.

VINYL ACETATE

PROCESS for continuous production of vinyl acetate, an intermediate for resinous condensation materials. Developed by research department, Shawinigan Chemicals, Ltd., Shawinigan Falls, Quebec, Can.

Advantage of continuous vinyl acetate process is fact that product can be removed continuously by circulating acetylene, with continuous still separating



vinyl acetate from unreacted acetic acid. Important advantage is increased conversion of acetic acid to ethylidene diacetate or vinyl acetate, as desired.

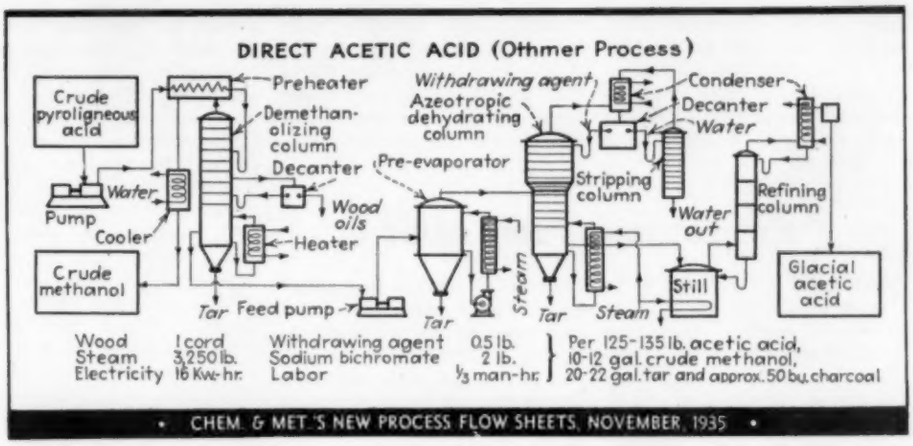
Practicable plant process including necessary recovery systems developed together with perfection of special method of catalysis. Catalyst must have long life, selectively promoting combination of acetylene and acetic acid, forming vinyl acetate, at same time depressing combination of vinyl acetate and acetic acid to form ethylidene diacetate.

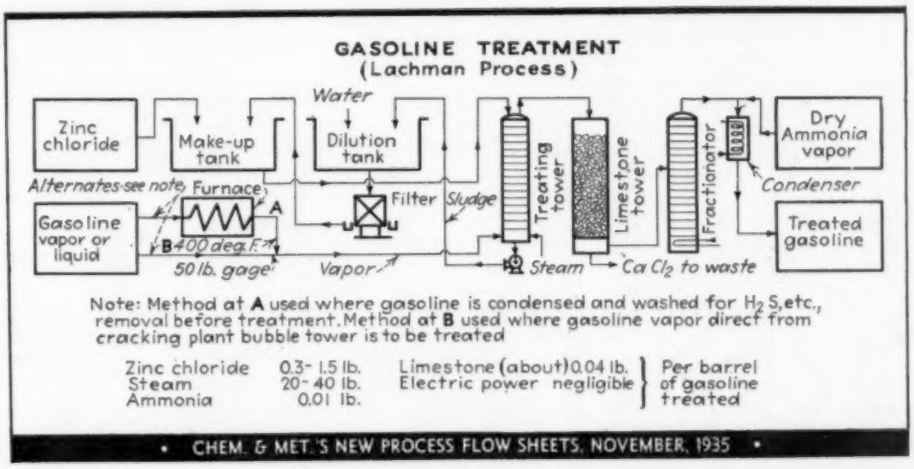
Flowsheet may be divided into four systems—catalyst-kettle-circulation system; vinyl acetate system; ethylidene diacetate system; and mercury recovery system. First system, composed of catalyst unit, reaction kettle, and acetylene circulation unit, produces ethylidene diacetate, vinyl acetate, or both. Former by refluxing reaction kettle, latter by quick removal of product.

Second system includes continuous still to separate condensate into crude vinyl acetate and acetic acid, returning latter to kettle system. Using refining still, crude vinyl acetate is separated into acetaldehyde fraction, middle fractions for redistillation, and refined vinyl acetate; residue, chiefly acetic acid, returns to kettle. Varying according to ratio of esters produced, capacity of system is maximum, if ethylidene diacetate alone is produced by permitting conversion of vinyl acetate to ethylidene diacetate.

After separation of sludge for recovery of mercury, calcium acetate added to liquor from kettle system to combine with residual mineral acid. Vacuum still equipped with agitator separates this liquor into (1) "first fraction," returned to continuous still, (2) crude ethylidene diacetate, then subjected to vacuum fractionation, and (3) dry residual waste. If vinyl acetate only product desired, system can be modified to hydrolyze crude ethylidene diacetate, returning acetic acid to kettle.

Mercury recovery system, same for all degrees of conversion, consists of simple distillation furnace modified for removal of organic matter by combustion.





DIRECT ACETIC ACID

CONTINUOUS process for separation of crude methanol, refined glacial acetic acid and tar from pyroligneous acid, devised by D. F. Othmer, Department of Chemical Engineering, Polytechnic Institute of Brooklyn, N. Y.; first installed at plant of Gray Chemical Co., Roulette, Pa., by Vulcan Copper & Supply Co., Cincinnati, Ohio.

Raw pyroligneous acid direct from hardwood distilling retorts passed through specially designed demethanolizing column removing: (1) mixture of methyl alcohol and methyl acetone at top, (2) wood oils at side through decanter, and (3) de-alcoholized liquor and tar from base. Fed by calibrated metering pump through pre-evaporator aqueous acid as vapor enters side of dehydrating column. Tar settling from base of methanol column and pre-evaporator separately exhausted of acetic. Water vapors passing into column form azeotropic mixture with withdrawing agent supplied; are rectified almost entirely free of acetic acid by this distillation. Vapor mixture issues from top of the column, passes to condenser, where two-phase condensate is decanted. Layer of withdrawing liquid returns to the column as reflux and water, retaining under 0.05 per cent acid, enters stripping column, to exhaust small quantity of dissolved withdrawing agent. Acetic acid with trace of tar, entirely anhydrous on reaching base of column, enters batch distillation column producing: (1) pure glacial acetic acid, and (2) fraction of high boiling homologues.

One operator per shift sufficient. Daily capacity is pyroligneous liquid from 90 cords of wood.

Process profitably replaces former production of calcium acetate. Produces excellent acetic acid, latter being marketed in aluminum tank cars.

GASOLINE TREATMENT

PROCESS for refining cracked gasoline, using hot, concentrated zinc chloride solution. Developed by Arthur Lachman and Richfield Oil Co. Originally installed at latter's Wilmington, Calif., refinery. Other plants in U. S., Canada, France, Germany and South Africa. Average size plant refines 5,000 to 7,500 barrels per day.

Zinc chloride process may be operated in two forms as shown by flow sheet herewith. In first, gasoline produced by cracking is condensed and washed to remove H_2S and soluble impurities, then evaporated in pipe still and vapors treated with $ZnCl_2$ solution before condensation. In second form vapors coming directly from cracking stills and containing all of the gases and impurities usually removed by washing are sent directly into $ZnCl_2$ system, thereupon condensed after fractionation and separated from fixed gases.

Solution and handling losses in zinc chloride process nor-

mally less than 1 per cent. Dry ammonia gas (0.01 lb. per barrel) added after final distillation to prevent corrosion in condensers. Polymerization losses vary with type of stock being treated, ranging from 1 per cent to as high as 3 per cent for distillates from vapor-phase cracking. Zinc chloride process removes 30 to 40 per cent of sulphur in cracked gasoline.

ELECTROTHERMIC ZINC OXIDE

PRODUCTION of zinc oxide from sphalerite ore by electrothermic smelter. Developed by engineers of St. Joseph Lead Co. and installed at Josephtown Smelter of the company.

High grade sphalerite ore, with medium iron content, mined and concentrated. Zinc sulphide concentrate desulphurized in multiple hearth roasters. Sulphur dioxide passes to acid plant. Calcines from roasters conveyed by water-cooled conveyor to elevator, thence to storage bin from which they are carried by belt to main storage in sintering plant. Then mixed with various fluxes, fuel, and residue materials, and discharged onto sintering machine.

Strong down-draft maintained on sintering machine and charge ignited by gas burner so that combustion is progressive down through bed as machine moves forward to discharge position. Sintering takes place at about 1,600 deg. F. Discharge from sintering machine crushed, screened, and combined with carefully sized coke and sent to furnaces. Coke fines rejected used for fuel in mix prepared for sintering machines.

Sinter and coke stored in bins above furnaces and fed automatically to natural-gas-fired rotary drums serving as preheaters. Preheated material is charged continuously to furnaces in which charge itself serves as resistance in developing proper temperature. These are probably largest resistance furnaces in world. Electrodes distributed around top and bottom of each furnace supplied to carry current to charge. At any one time, total incandescent charge in furnace is about 20 tons.

Furnace atmosphere consists of zinc vapor and carbon monoxide; after condensation of zinc it contains about 99 per cent CO. When greater part of zinc has been smelted from charge, residues are discharged continuously, and retreated by various means, such as magnetic separation and screening for the recovery of any zinc fines and unburned coke. Values returned to process and valueless material sent to dump. Zinc vapor and carbon monoxide leaving furnace oxidized at several points, and oxide and gases passed through a fan, thence to a cyclone separator (to remove heavy foreign material) and finally to bag filter. Bags automatically shaken at intervals, oxide collected, screened, graded, packed, and sent to storage.

ALUMINUM COATING

PROCESS for coating metals with aluminum by introducing metal to be coated into molten aluminum bath. Developed by Prof. Colin G. Fink, of Columbia University, to provide smooth, bright aluminum coatings suitable for industrial use.

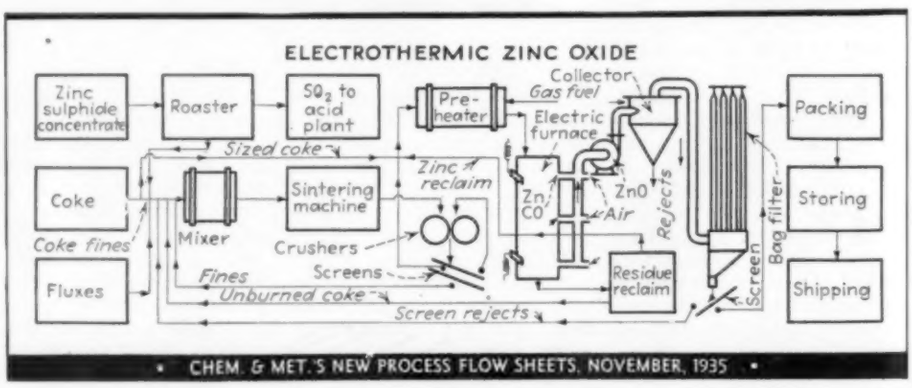
Process relates to coating all metals, but particularly ferrous metals, with aluminum alloys, commercial aluminum or pure aluminum. Alloy bond of aluminum and iron or other metal formed at surface of article to be coated. Practical and satisfactory continuous working process for manufacture of coated wire, rods, bars, beams, sheets and strips, such as may be used in fabrication of metal products.

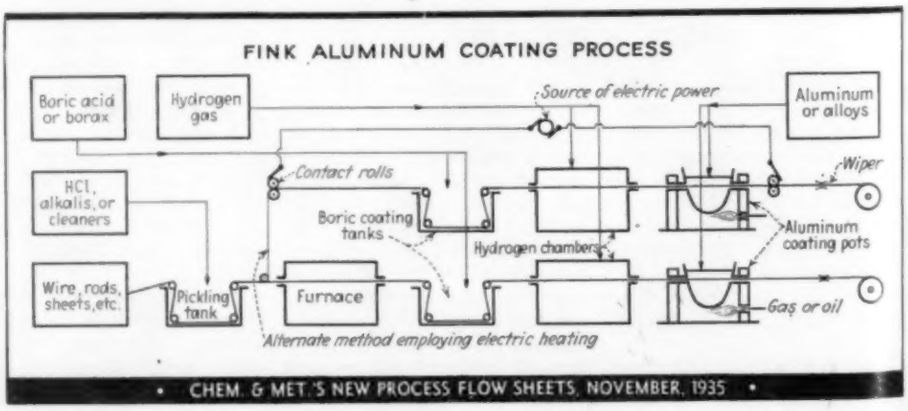
Wire or other object to be coated cleaned by passing through pickling vat containing solution of hydrochloric acid, an alkali bath, or any desired combination of cleaners. Then heated to red heat in oven containing heated air, or, as in alternate method shown in flow sheet, may be heated electrically. Hot wire is preferably passed through solution of boric acid or borax. Effect of heating wire is to drive out water immediately surrounding wire and concentrate solute on surface. Use of boron compound, however, not essential; it is found that hydrogen in surface of steel serves as important "fluxing agent" during initial formation of alloy between coating and base metal.

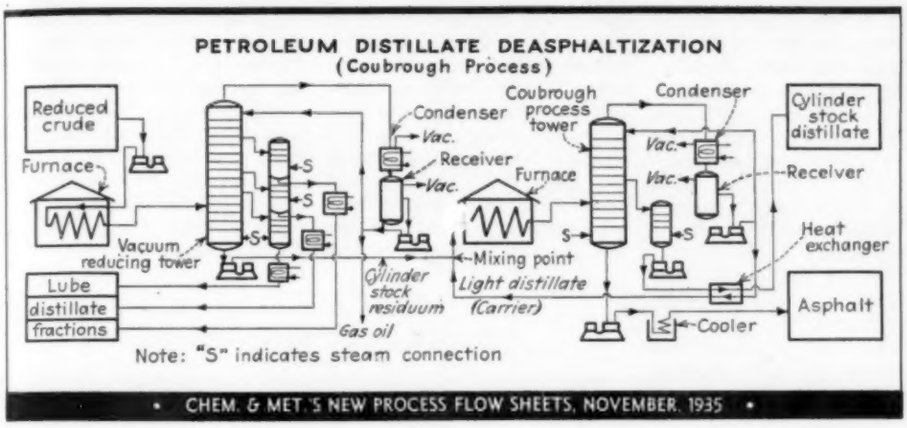
Wire then passed through hot hydrogen chamber, being deoxidized; surface portion charged with hydrogen prior to reaching aluminum bath. From furnace wire passes into bath of aluminum below surface. Coated wire may be removed from molten bath of aluminum through orifice in pot below level of aluminum. Coated articles preferably wiped after leaving bath and while aluminum coating is still plastic to remove surplus aluminum and regulate thickness of coating. Guide or roller provided for guiding wire in and out of bath and for collecting coated wire. Drawing speed of 10-50 ft. per minute has been used in coating 28-gage wire.

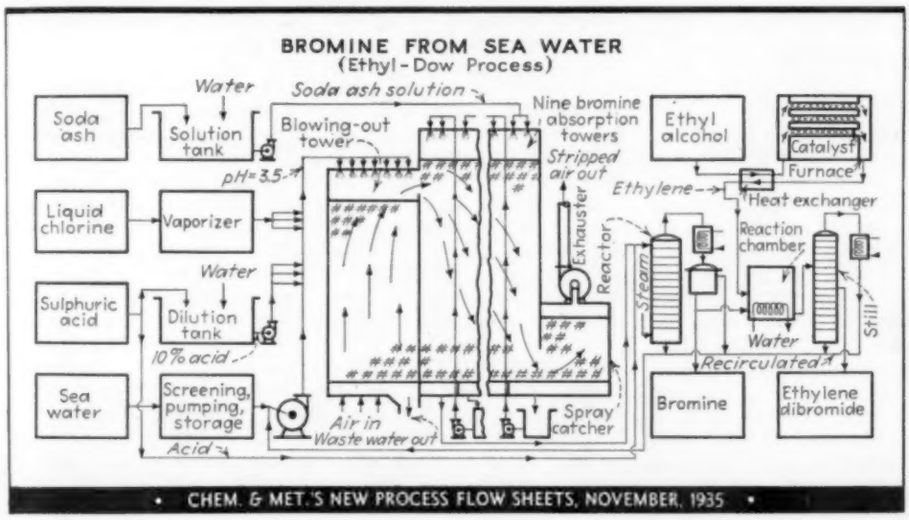
DEASPHALTIZING PETROLEUM DISTILLATES

COUBROUGH process for recovery of heaviest lubricating oil fractions and simultaneous production of high quality asphalt from reduced crude oils. Developed by Lummus Co. in large scale experimental plants first at Everett, Mass., and









at later time at Bayonne, N. J.

In principle, Coubrough process calls for flash vaporization of blend of flux or fuel oil residuum with non-vaporizable asphaltic material and light distillate or "carrier." Blend may be controlled to give mixture of such proportions that vaporization steps can be readily accomplished without danger of exceeding cracking temperatures nor necessity of high vacuum. Typical residuum used would consist of heaviest lubricating oil fraction (usually cylinder stock) and asphalt. Present operating methods readily produce residuum of this character and still provide for sufficient fractionation of lighter lubricating distillates. To residuum is added asphaltic material, practically non-vaporizable and inert. Necessity for adding unvaporizable material determined by characteristics of crude oil, since many crudes contain enough asphalt to render step unnecessary. For fluxes of low asphalt content, however, additional asphaltic material has definite function in providing proper blend.

"Carrier," which may be any available distillate with boiling range from heavy naphtha to light gas oil, is added to stream through mixing device and three components thoroughly mixed to form homogeneous blend. Blend heated in pipe still and introduced into specially designed vacuum column where heavy lubricating oil fraction and "carrier" flash off as vapor, leaving asphalt as unvaporized residue.

Because of large gap between boiling ranges of "carrier" and heavy lubricating oil, their separation from vapor mixture comparatively easy. Adjustment of blending and heating makes operation flexible enough for any residuum, regardless of original proportions of heavy lubricating oil and asphalt.

Application of process to present equipment results in very considerable increase in operating capacity without overloading existing oil-heating or fractionating equipment. Also results in considerably reduced temperature levels at same throughput for existing equipment, thus decreasing chances of thermo-decomposition. Facilitates making asphalt of various grades, at same time producing lubricating oil distillates at lower temperatures than possible with standard equipment. Essentially, operation is divided so that production of asphalt and lubricating oil distillate is not carried out in same fractionating vessel, but individually controllable.

BROMINE FROM SEA

PROCESS for recovering bromine from ocean water and similarly dilute brines; developed by chemists and engineers of Dow Chemical Co. First commercial application in plant of Ethyl-Dow Chemical Co., Kure Beach, near Wilmington, N. C., where recovered bromine is converted to ethylene dibromide for use in Ethyl gasoline. Bromine capacity in excess of 500,000 lb. per month.

Sea-water contains about 3.5 per cent total solids of which only 65 to 70 p.p.m. is bromine. Latter extracted at Kure Beach in two identical units (one shown diagrammatically in accompanying flow sheet). Unit consists essentially of blowing-out tower in which current of air removes bromine from sea water previously acidified with dilute sulphuric acid to optimum pH of 3 to 4. Acidification requires about 0.27 lb. 98 per cent H_2SO_4 per ton of sea water. Water oxidized with sufficient chlorine to liberate bromine requiring about one mol Cl per mol Br. Extraction of bromine from air effected in nine huge absorption towers using soda-ash solution, in countercurrent, to form dissolved mixture of sodium bromide-bromate. Treatment with sulphuric acid liberates bromine vapors which are steamed out of acidified solution and condensed to form pure liquid bromine.

At Kure Beach plant bromine is manufactured into ethylene dibromide by standard methods using ethylene gas prepared by passing ethyl alcohol over heated kaolin catalyst. (For other details of process see U. S. Patents to J. J. Grebe, R. H. Boundy, and L. C. Chamberlain, 1,917,762, July 11, 1933; and 1,944,738, Jan. 23, 1934.)

THIOKOL

PROCESS for producing polymethylene polysulphides. Developed by J. C. Patrick, Thiokol Corp., operated at Yardville, N. J., plant, producing basic compounds trademarked "Thiokol."

Materials are rubber-like, having many physical and electrical properties of rubber. As construction materials have certain advantages over rubber. Immersion in gasoline, lubricating oils, benzol and chlorinated solvents affect Thiokol little. Inert to lacquer solvents and dilute acids. Suitably prepared Thiokol articles are non-oxidizing, and unaffected by sunlight within a year.

Products are essentially polysulphides of several bifunctional olefin derivatives and linear polymers of high molecular weight. Manufactured from ma-

terials abundant in United States. Supplied as uncured sheets, physically similar to natural "smoked sheet rubber," and also as coating liquid and molding powder.

ALUMILITE PROCESS

ELECTROLYTIC process for oxide-coating aluminum and its alloys. Developed by Aluminum Colors, Inc., and Aluminum Company of America.

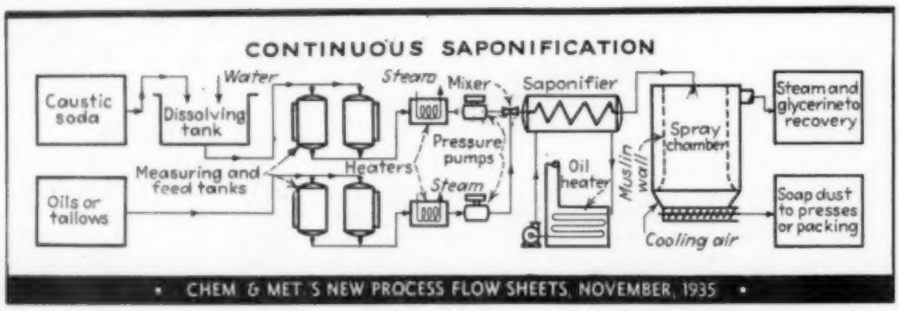
Article to be coated made anode in special acid electrolyte for 10 to 60 minutes at 12 amp. current density. Oxide coating thickness controlled to 0.1—0.6 mil range. Coating is abrasion-resistant and non-smudging, is porous and highly adsorbent. Can be durably colored with dyes or impregnated with pigments. Sealing processes make coatings impervious without color change; impregnatable with corrosion inhibitors.

Serviceable for refrigerator trays, kitchen utensils. Particularly adaptable for handrails, cafeteria trays. Hardness and oil-adsorbing capacity of coating suggest automotive piston use. Colored pigment adsorbability provides varied uses.

CONTINUOUS SOAP PROCESS

PROCESS developed in Great Britain (British Patent No. 367,513); described by C. M. Adcock (*The Industrial Chemist*, May, 1935, pp. 181 ff.); obtains very rapid saponification of glyceride at 250-300 deg. C. by keeping reaction time down to about 30 seconds and working at pressures of 800 to 1,500 lb. per square inch.

First experimental work carried out with ¼-in. bore tube as reaction chamber, heated by high-boiling-point hydrocarbon oil. Charge of fat or oil and 50 per cent caustic soda solution mixed in correct proportions, pumped through reaction chamber at velocity of about 8 ft. per second, giving good heat transfer and reaction time of approximately 30 seconds. Saponified mixture passed into muslin-lined spraying chamber from which steam escaped while retaining soap. Found that all glycerine but about 2 per cent could be vaporized from the soap, that by varying working conditions, soap of any degree of hydration could be produced. Working without cooling coil between reaction tube and spraying chamber, soap with 85 per cent total fatty acid readily obtained in form of fine, impalpable powder. Using cooling coils to condense water and reduce fatty acid content to about 70 per cent, various grades of granulated soap could be made by use of suitable spray nozzles. Process also had surprising effect in bleaching many oils and effecting some deodorization suggesting that soap could be made from inferior oils. Results confirmed on semi-works scale. Our flow sheet based on suppositions concerning suitable full scale equipment.

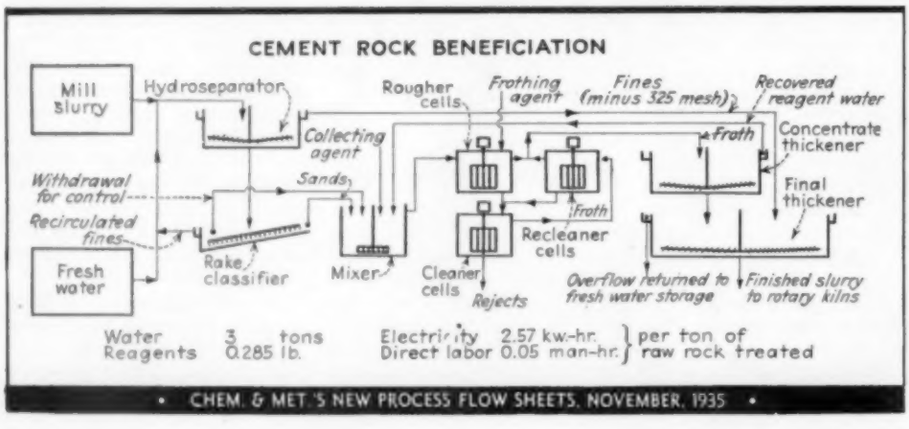


CEMENT ROCK BENEFICIATION

PROCESS for concentrating low-grade cement rock, for producing any desired type of cement, developed by Valley Forge Cement Co. and employed in company's plant at West Conshohocken, Pa. Process produces mill benefits sufficient to pay for its operation in reduced grinding cost. Also decreases quarrying costs, extends available quarry supply, makes mill independent of outside supplies and produces superior clinker. Similar process developed for producing high-grade lime from low-grade limestone.

Mill slurry run through hydroseparator, fines going to final thickener (see flow sheet). Plus 325 mesh material goes to rake classifier, from which fines recirculate to hydroseparator. Sands discharge to mixer where mixed with oleic acid collecting agent to coat calcite particles for selective bubble attachment. Diluted in mixer with returned reagent water. Mixture passes to rougher flotation cells, there receiving frothing agent. Froth (calcite, principally) passes to concentrate thickener and underflow to cleaner flotation cells. Cleaner tailings rejected and froth recleaned. Recleaner tailings recirculated to cleaner and froth to concentrate thickener. Concentrate thickener recovers reagent water, discharging sludge to final thickener. Overflow from final thickener returned to raw water tanks and slurry passes to mill kilns for burning.

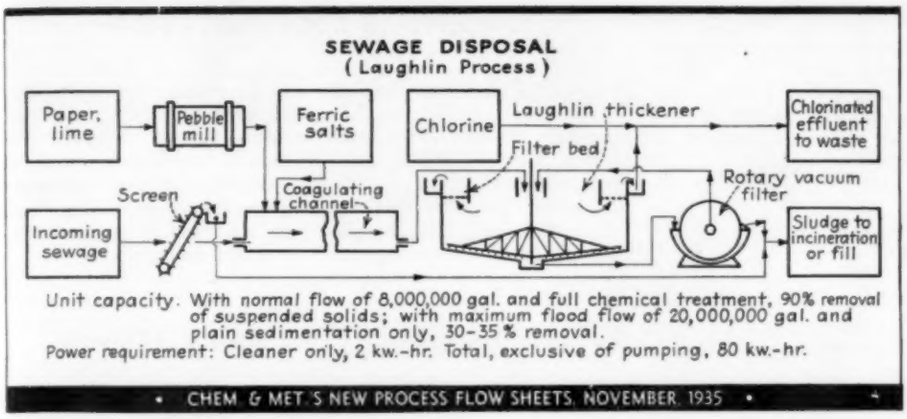
Performance of concentration plant illustrated by typical analyses: Raw rock: SiO_2, 17.03; Fe_2O_3, 2.54; Al_2O_3, 6.03; $CoCO_3$, 70.11; and $MgCO_3$, 3.83 per cent. Rejects (10 per cent of raw rock), SiO_2, 44.24; Fe_2O_3, 6.22; Al_2O_3, 25.50; $CaCO_3$, 16.81; and $MgCO_3$, 5.82 per cent. Corrected cement mix (90 per cent of raw rock), SiO_2, 14.02; Fe_2O_3, 2.13; Al_2O_3, 3.88; $CaCO_3$, 76.02; and $MgCO_3$, 3.61 per cent.



SEWAGE DISPOSAL

PROCESS developed by W. C. Laughlin and Filtration Equipment Corp. for chemical treatment of sewage. First plant installed at Dearborn, Mich. (see *Chem. & Met.*, March, 1932, pp. 101-2). New developments as incorporated in most recent installation at Perth Amboy, N. J., are shown in accompanying flow sheet.

Perth Amboy plant designed for normal flow of 8,000,000 gal. with maximum flood flow of 20,000,000 gal., providing for


SEWAGE DISPOSAL
(Laughlin Process)
Paper, lime
Pebble mill
Ferric salts
Chlorine
Laughlin thickener
Chlorinated effluent to waste
Filter bed
Screen
Coagulating channel
Rotary vacuum filter
Incoming sewage
Sludge to incineration or fill
Unit capacity. With normal flow of 8,000,000 gal. and full chemical treatment, 90% removal of suspended solids; with maximum flood flow of 20,000,000 gal. and plain sedimentation only, 30-35% removal.
Power requirement: Cleaner only, 2 kw.-hr. Total, exclusive of pumping, 80 kw.-hr.
• CHEM. & MET.'S NEW PROCESS FLOW SHEETS, NOVEMBER, 1935 •

full chemical treatment for summer months to give minimum of 90 per cent removal of suspended solids. During balance of year plain sedimentation with magnetite filtration is used. General objective is purification of waters of Raritan Bay, for which this is first unit. During past summer season, when chemicals were used, purification of sewage permitted return of fish life and use of Raritan Bay water for recreational purposes.

Steps in Laughlin process consist of screening, addition of chemicals controlled from venturi, floccing, settling in 80-ft. tanks, filtration of tank effluent and its chlorination, followed by vacuum filtration of settled sludge. At present at Perth Amboy, sludge used as land fill but installation of incinerator such as used at Dearborn is proposed. Sewage retained in plant for only 2 hours and sludge removed daily.

In plain sedimentation of sewage, removal of 30 to 50 per cent suspended solids is normal obtained. At Perth Amboy, such removal without chemicals ranges as high as 80 to 85 per cent, due to magnetite filter bed which coagulates fine material into easily settled solids. These are removed from magnetite bed by automatic electrical cleaning device which lifts magnetite by solenoid action, washes and deposits it in place. Wash water returns to center of sedimentation tank in readily settleable condition.

Magnetite bed 3 in. deep and 12 ft. wide, set around periphery of tank with permissible filtration rates of 2 to 4 gal. per sq.ft. per minute. Operation of cleaner intermittent and its power requirement 2 kw. Noticeable features of Perth Amboy sewage are large quantities of suspended solids and industrial wastes. Yet plant has low power requirements for full treatment. Exclusive of pumping, this amounts to less than 80 kw.-hr. per million gallons.

CAUSTIC SODA RECOVERY

PROCESS for recovery of caustic soda by dialysis. Developed by Dr. Leonardo Cerini, to recover this chemical in viscose rayon plants. Although not new, application in United States plants is recent.

Cerini dialysers recover 90 per cent of caustic soda in liquor from final pressing of pulp in steeping operation. Direct operating cost of dialyser about $550 per year in average plant, including maintenance. Operation requires only daily sampling and inspection. Requires no power or labor for equipment itself.

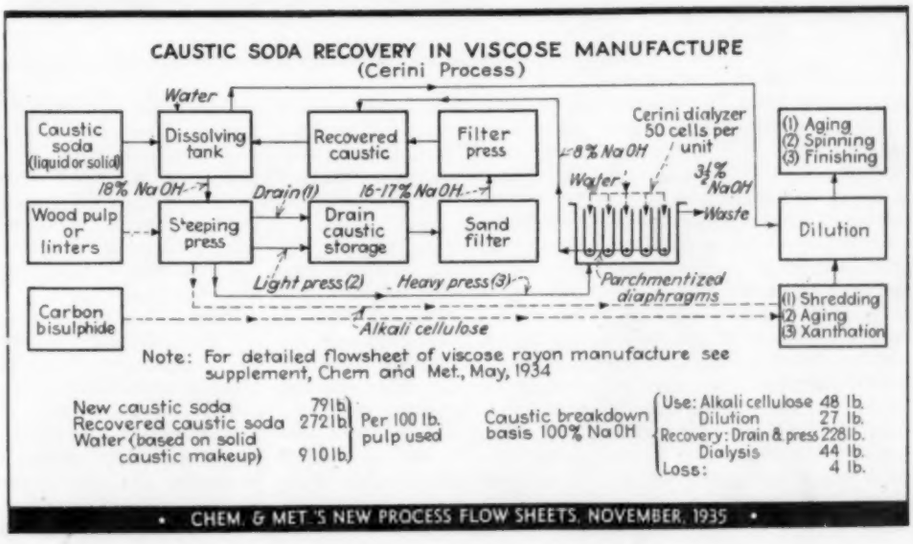
Cerini dialyser, removing over 90 per cent of dissolved hemi-cellulose and practically all carbonates, metallic impurities, and pulp shreds, is capable of purifying daily minimum of 1,500 liters of 16-17 per cent caustic, recovering 90 per cent as 8 per cent solution.

Process functions on principle of osmotic exchange between solutions of different concentrations when separated by semi-permeable membrane. Impure solution enters bottom of tank at 16 per cent NaOH, 4 per cent carbonates, 2 per cent organic matter. Water enters top of diaphragm, becoming progressively charged with soda while impure solution is progressively depleted of soda; overflow of tank has soda concentration just sufficient to keep hemi-cellulose dissolved. Active diaphragm area about 300 sq.m. per unit, each cell being 3 m. long, 1 m. high, and 2½ cm. wide. Average solution concentrations maintained by control of relative flows.

SULPHITE DIGESTION

PROCESS for forced circulation and automatic control of sulphite pulp digesters. Developed by operating and engineering departments of Kimberly-Clark Corp.; first installed at Kimberly, Wis., plant of company, to improve quality and yield of sulphite pulp produced.

Economy in steam consumption and automatic control of temperature and pressure schedules obtained. Forced circulation of acid cooking liquor through external heater and throughout digester contents during major portion of cooking cycle eliminates local zones of over-, under-cooking, producing more uniform quality of pulp. Automatic air-operated temperature and pressure regulators used in connection with forced circulation system, controlling heater output temperature and digester relief, insuring repetition of conditions from batch to batch and uniform quality between batches. Use of heat interchangers for bringing circulating liquor up to cooking temperatures permits recovery of condensate and reuse as make-up water in boiler house, thus reducing make-up water



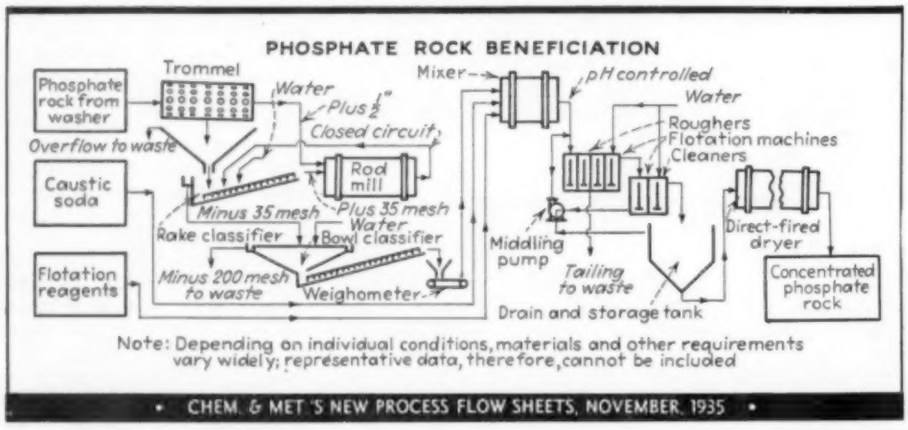
treating costs and permitting of recovery of heat in condensate.

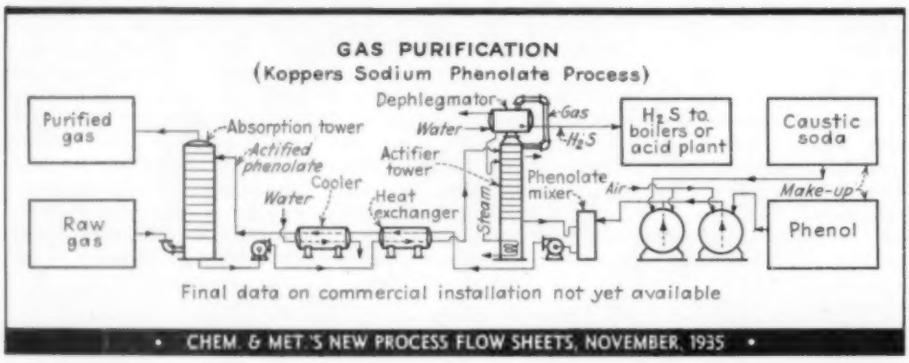
Through use of forced circulation, lower cooking temperatures than normal required for same grade of pulp, thus saving steam. Additionally, forced circulation permits charging digester more heavily with wood, increasing productive capacity of unit about 25 per cent. Special wood chip packer to accomplish this also developed in connection with project.

GAS PURIFICATION

PHENOLATE process for desulphurization of fuel gases on hot actification principle, developed by Koppers Research Corp. and already commercially installed.

Application of process to high-sulphur refinery-still gas and natural gas especially favorable on account of large by-product sulphur credit, making net cost of purification practically zero. Process uses special solution of sodium phenolate for absorption of H_2S. Solution has high carrying capacity for H_2S, amounting to about 1,000 grams per gallon for coke oven gas and 2,000-4,000 grams per gallon for refinery and natural gas. Foul solution from absorber is preheated in heat exchanger by hot actified solution, flowing to actifier where hydrogen sulphide is swept out by steam from boiling solution in bottom of actifier; latter heated by indirect steam. Steam and some phenol leaving top of actifier return to solution by reflux condenser, leaving hydrogen sulphide substantially pure for production of sulphuric acid, etc. Actified solution leaving actifier gives off part of heat to foul solution in heat exchanger, then further cooled in cooling coils and flows into top of absorber, again beginning circuit. Make-up phenolate provided by circulating actified solution through mixing cylinder where fresh phenolate is added.





PHOSPHATE ROCK FLOTATION

PROCESS applying flotation to increase recovery of P_2O_5 values or improve grade from Florida and Tennessee phosphate washing operations; developed by Phosphate Recovery Corp., Mulberry, Fla. Supplementing usual washer system, working hitherto impractical areas becomes profitable, at installation cost approximately $50 per ton-day feed capacity (roughly one-tenth that for customary flotation of sulphides and metallics) and about 15 cents per ton feed operating cost. Overall P_2O_5 recovery greatly increased, also obtaining increased average B.P.L. value, and desirable simplification of washer system.

Phosphate ore reduced to size range suitable for flotation (28 to 35 mesh) by closed circuit grinding and classification, completely deslimed by bowl classifier. Passed to continuous mixing conditioner where simultaneously, (1) pH is suitably adjusted, (2) soap-forming fatty acid is added, and (3) small amount of fuel oil is added cutting down necessary quantity of more expensive fatty acid reagent. Proportioned mix is fed to suitably interlocking series of roughing and cleaning flotation machines. Concentrate is dried and shipped.

SUGAR REFINING

RELATED processes evolved by George E. Stevens, and others of the Western States Machine Co., greatly increase sugar recovery from centrifugals and offer possibilities in other industries manufacturing crystalline products. Process now being installed in large Eastern sugar refinery, expected to increase yields by 400,000 lb. daily.

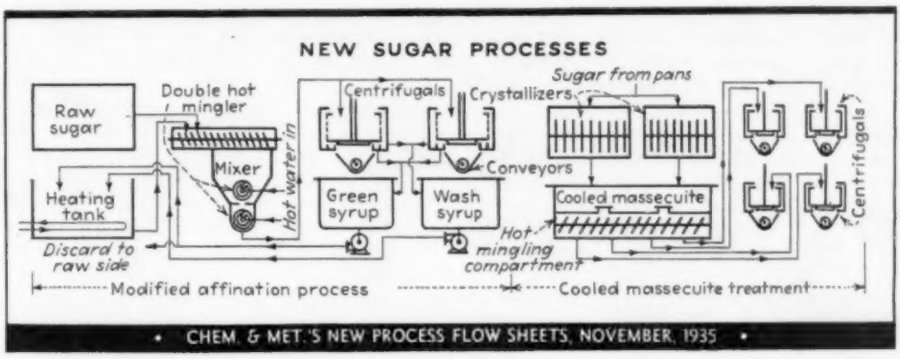
Continuous hot mingling process reduces viscosity of magmas or massecuites directly before centrifuging to produce proper fluidity without appreciable dissolution of crystals, making possible optimum efficiency in centrifugal operation with uniform quality of product. Rapid circulation of hot water, in large, specially designed moving heating surfaces, serving both for heating and agitation, gives desired fluidity without localization of heat and with minimum dissolution of sugar.

Modified affination process involves use of hot saturated syrups, hot mingling process and high-speed centrifugals. Saturated syrup is mixed with raw sugar to form heavy magma (93.5 to 94 per cent dry substance). Is then rapidly reheated to 145-150 deg. F. and spun in new gear-driven, high-speed centrifugals. Results obtained contrast with older methods of raw sugar treatment, i.e., 33 per cent decrease in affination syrup required; 8 to 10 lb. more sugar per 100 lb. of magma; 40 per cent reduction in raw sugar dissolved; highest refinement of raw sugar crystals, maximum color elimination; 30 per cent reduction in wash water; 40 per cent reduction in remelts.

White massecuite treatment involves installation of Roberts stirrers and modified mingling system in white mixers, preventing sludge and crust formation on massecuite, maintaining uniform density. Modified hot

mingling system maintains pan massecuite temperature or increases it if desired, supplying centrifugals with constant temperature massecuite, assuring uniform sugar with minimum wash water. Permits pan to be boiled at maximum density, resulting in greater sugar yield. Average increase has been 20 lb. sugar per centrifugal cycle.

Process for treatment of cooled massecuite from crystallizer involves rapid reheating by hot mingling process directly before centrifuging, dissolving very little sugar and producing a high fluidity of massecuite. Has resulted in up to 40 per cent increase in centrifugal capacity. Also lower purity molasses and higher quality raw sugar produced.



COATING PROCESS

DEVELOPED to apply nitrocellulose directly to porous sheet, in form of aqueous emulsion, in which viscous nitrocellulose lacquer is disperse phase. Worked out by Hercules Powder Co. to produce thin, continuous, non-porous film over surface of sheet.

In this method no nitro-cellulose is wasted by penetrating sheet, and no preliminary surface sizing treatment necessary. Economy of method obvious considering its complete elimination of preliminary surface-sizing treatment. Also reduces cost of lacquer itself by eliminating a part of solvent necessary when applied by ordinary methods. As solvent of any kind costs more than water, saving is apparent.

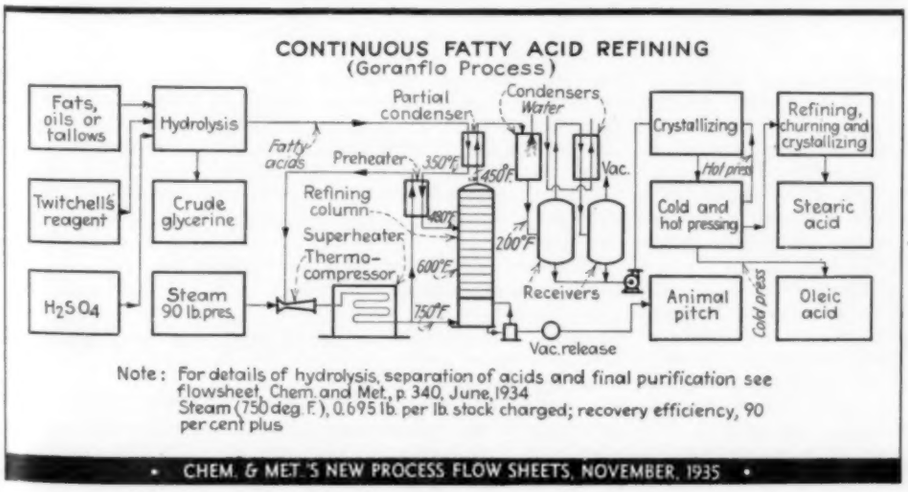
Lacquer emulsions have been applied to paper both by spraying and roller coating. No difficulty anticipated in coating with knife coating machine.

FATTY ACID DISTILLATION

FATTY acid distillation process, developed by Stanley Goranflo; first installed at Philadelphia plant of Wilson-Martin Co.; has given increased throughput, higher yield and better quality.

Efficiency of unit and quality of distillate dependent upon pressure, temperature and heating rate at different stages of process. During recent 90-hour run, 95 per cent free fatty acid stock was charged with recovery of over 90 per cent having N.P.A. color of 1¾. 129,039 lb. of stock required 89,760 lb. of steam at 750 deg. F. Bubble tower has capacity of 650 lb., allowing 24 minutes for stock to pass through tower. At this velocity, stock was heated at rate of 12 deg. F. per minute. Beef tallow stock was used but test runs using cotton seed, peanut and corn oil and other fatty acids as charging stock have given exceptionally high yields of deodorized products.

Operation as follows: Charging stock enters heat exchanger at temperature of 150 deg. F., preheated to 350 deg. Before going to bubble tower, temperature of stock raised rapidly to 480 deg. in final heater. Steam rises countercurrent to stock in bubble tower and carries fatty acid vapors through outlet. Vapors pass through heat exchanger used to preheat charging stock and then to spray condenser where cooled to 200 deg. under vacuum. Condensed fatty acids collected in separator and withdrawn from bottom, while vapors leave from top for condensation in final condenser and collection in receiver. Greater part of condensation takes place in spray condenser and little in final receiver. Operating conditions such that condensation is carried out above boiling point of water and below boiling point of fatty acids. Absence of quantities of water eliminates emulsification difficulties; odoriferous portions are steam soluble and are carried off by steam. Black residue is marketed as animal pitch and used in manufacture of slow-burning electrical insulation.



OIL SLUDGE RECOVERY

PROCESS for recovering petroleum refinery acid sludge as new, clean, strong, sulphuric acid; developed by late E. Hechenbleikner of Chemical Construction Corp. and employed by W. H. Daugherty & Sons Refining Co., Petrolia, Pa.

Acid sludge is complex mixture of acid, oil, asphaltic hydrocarbons and sulphuric acid products. Is colloidal suspension, broken by agitation with water. Older recovery processes lose considerable acid and retain hydrocarbons. New process operable also on cracked distillate sludge, makes possible quantitative reduction to SO_2, forming practically no SO_3. Heat for decomposition secured with gas or oil flame in rotary furnace where hydrocarbon content of sludge serves as reducing agent. Sludge and flame travel countercurrent through several compartments. Dry coke discharges at one end, gases at 250-350 deg. F. at other end. Latter contain 15-20 per cent SO_2, are cooled in washers by recirculated water. SO_2 dried over strong sulphuric acid, diluted to 8 per cent SO_2 and 11 per cent, O_2, passed through blower, enters heat exchanger where heated to 450 deg. F. by SO_2 gases leaving converter. Gas is then converted using vanadium catalyst and SO_3 absorbed in towers producing

fuming acid and 98 per cent acid.

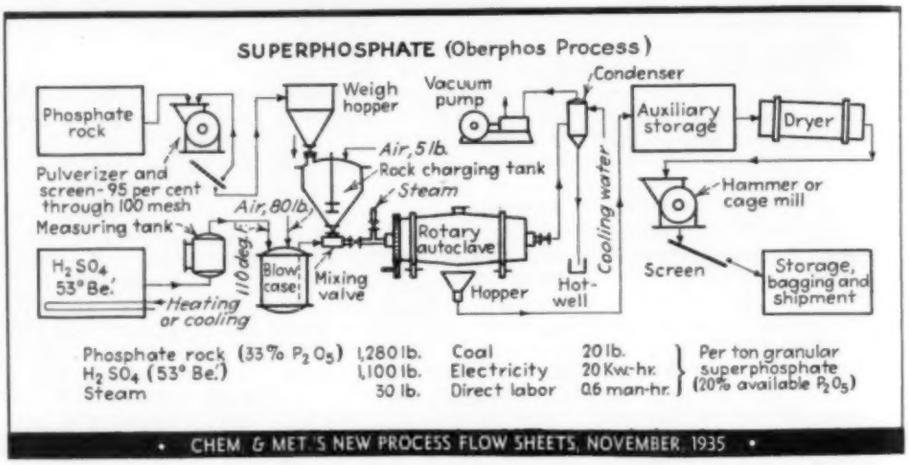
Recovery about 90 per cent of acid in sludge. Added SO_3 from sulphur burner makes up this and refinery loss. Acid cost for recovery plant operation approximates $4 per ton 100 per cent H_2SO_4.

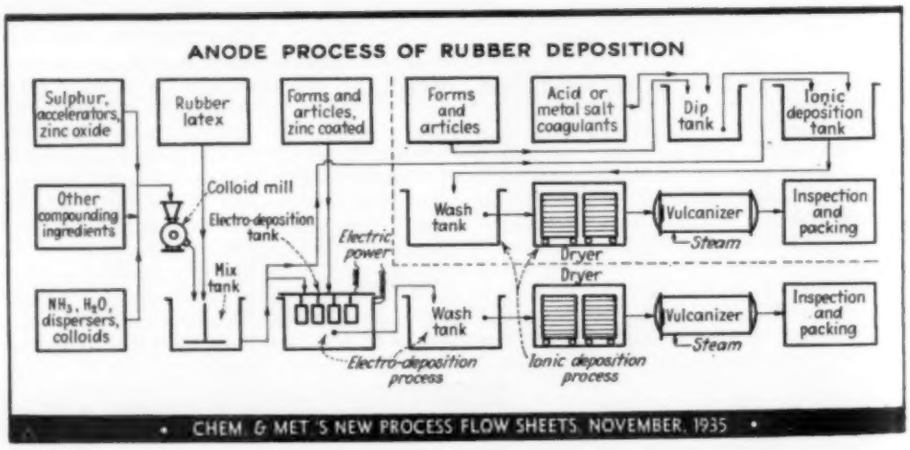
SUPERPHOSPHATE PROCESS

OBERPHOS process developed under sponsorship of G. Ober & Sons Co., Baltimore, Md., at whose plant first unit was built. Since then installed in several plants in England and Canada.

New process produces granular, free-flowing, non-setting product of superior handling, mixing and use characteristics. Reduces acid requirement and produces superphosphate of higher available P_2O_5 content.

Principal departure in new process is use of rotary autoclave where digestion of phosphate rock in sulphuric acid takes place under pressure. Auxiliary equipment permits rapid simultaneous charging of rock dust and acid into autoclave. Acid, 53 deg. Bé. and 110 deg. F., blown into tangential mixing valve by 80-lb. air. Rock dust, 95 per cent through 100 mesh, blown from agitated charging tank into mixing valve by 5-lb. air. Autoclave under 28-29 in. Hg vacuum when mixture admitted. Autoclave temperature of 300 deg. F., and pressure of 90 lb. produced by steam admission result in rapid reaction. Steam blown off after 20-30 min. and vacuum induced by condenser and pump. Heat stored in material dries it. Autoclave discharges nodulized material containing 8-9 per cent moisture. Drying then completed in small concurrent, direct-heat dryer without reversion of P_2O_5 to unavailable form. Material generally stored for final after-curing before drying. After drying product ground in cage or swinghammer mill, screened and bagged for shipment.





ANODE PROCESS

PROCESS for production of articles and coatings directly from rubber latex mixes. Developed by chemists and engineers of Eastman Kodak, Hungarian Rubber Goods Co., Dunlop Rubber Co., B. F. Goodrich Co., American Anode, Inc., and others. Process controlled by American Anode, Inc., and used by many licensees.

Anode process used to make gloves, balloons, drug sundries, specialties for medical profession, rubber shoes, fountain pen sacs, bathing caps, rubber thread and many other items. Also used to coat articles of metal and non-metal with rubber for protection against corrosion and abrasion, for insulation against electricity, sound, heat and vibration, and for numerous other purposes.

Rubber articles and coatings deposited rapidly and efficiently directly from water suspension containing unmasticated rubber latex particles and particles of compounding ingredients. Deposits up to ¼ in. or more in thickness obtained in one operation. Process replacing costly, tedious, and dangerous process of dipping in rubber cement. More practicable commercially than straight multiple dipping in latex for making deposits of any appreciable thickness. Process readily used to make rubber articles and coatings difficult or impossible to mold. Anode rubber reported to have great strength, high tear resistance and long life. Process now available for a multitude of purposes.

Operation as follows: Sulphur, zinc oxide, organic accelerators, age-resistors, dyes and other compounding ingredients mixed separately or in combination with water, ammonium hydroxide, dispersing agents and protective colloids. Mixtures run through colloid mills to produce stable dispersions. Mixed with rubber latex. Latex mixes placed in tanks for electrodeposition or ionic deposition.

Electrodeposition of rubber on zinc surfaces operates 500 times as fast as zinc itself can be electrolytically deposited. Particles of rubber and compounding ingredients concentrated near anode by electrophoresis and coagulated by streams of Zn^{++} and H^{+} ions migrating outwards from the anode surface. Deposits washed, dried and vulcanized.

Ionic deposition also very rapid. Forms and articles dipped in solution containing a polyvalent metallic salt or an acid. Then dipped in latex mix. Positive ions diffuse outward from form and article surfaces, coagulating deposits of Anode rubber. Deposits washed, dried and vulcanized.

LACQUER EMULSIONS

PROCESS for making emulsions of nitro-cellulose lacquer in which nitro-cellulose is dispersed as minute droplets

and actually suspended in water. Developed by engineers of Hercules Powder Co. to make clear films on any surfaces and under any conditions of atmosphere.

Following is example of wide variety of formulations which can be made. Lacquer phase: 38.5 parts ½ second nitro-cellulose, 23 triethyl citrate, 11 butyl acetate, 16.5 ethyl alcohol and 11 toluol. Water phase: 33 parts water and 0.33 sodium lauryl sulphate. Instead of triethyl citrate, any of usual lacquer plasticizers may be used. Other materials such as resins, waxes, pigments, etc., may be added to modify further properties of final film.

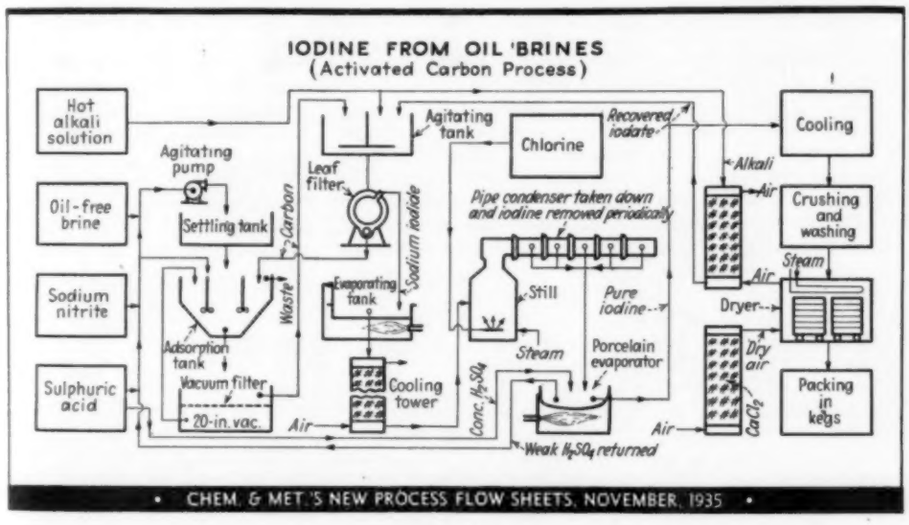
Production of nitro-cellulose emulsions has proved relatively simple, once correct formulation has been developed. Lacquer and water solutions prepared and mixed by stirring together. Mixture a coarse emulsion, then emulsified by passing through colloid mill. Mill of homogenizer type preferable to one of shearing type, giving smaller particle size.

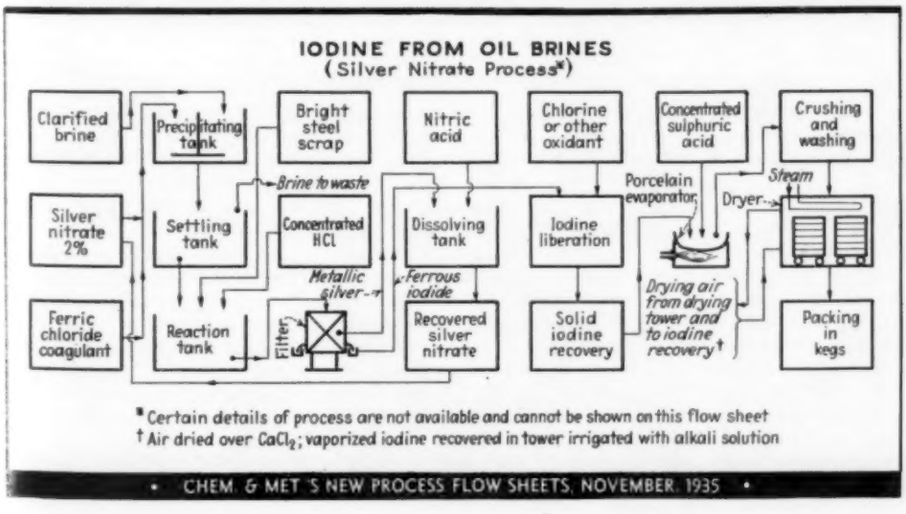
IODINE FROM WELL BRINES

TWO processes now employed in Southern California to extract iodine from oil-well brines containing quantities ranging from 30 to 70 p.p.m. That developed by General Salt Co. uses Nuchar, or activated carbon, process, while Dow-Jones or silver iodide method (patented by C. W. Jones, U. S. Patent 1,837,777 in 1931, and 1,853,621 in 1932) is used by Dow subsidiary, Iodow Chemical Co.

In carbon process, brine from which the oil has been removed is acidified with sulphuric acid. After settling to deposit mud and suspended solids, sodium nitrite added to oxidize iodides to iodine. Resulting yellow solution containing free iodine treated with activated carbon in large adsorption tanks of 300,000 gal. capacity provided with ten propeller type agitators. After settling, clear liquor decanted to waste and carbon reused several times before filtering in large concrete-walled vacuum filters with canvas filter bottoms. Liquor returned to adsorption tanks and wet carbon containing iodine shoveled into agitating tanks where treated with hot alkaline solution to yield sodium iodides. Carbon, removed on leaf filters, returns to cycle and sulphuric acid is added to free iodine which is recovered from purified liquor with chlorine and steam. Subsequent purification process as shown is patented by Girvin (U. S. Patent 1,857,632).

In silver process, 2 per cent silver nitrate solution in exact theoretical quantity is added to clarified brine in mechanically agitated wooden tanks. Silver iodide precipitate settles to bottom as small quantity of ferric chloride is added. Mixed silver iodide-ferric hydroxide sludge drawn off, again settled, and then treated with concentrated HCl to dissolve ferric hydroxide. Metallic silver displaced from solution by clean steel scrap, forming ferrous iodide in solution. Silver then recovered quantitatively as silver nitrate for reuse. Filtrate oxidized to liberate iodine which is precipitated, filtered and purified under concentrated sulphuric acid in accordance with Girvin process before final washing with water and drying with hot air dried over calcium chloride. Product so obtained known as "crude iodine" yet may run as pure as 99.8 per cent. Shipped in 200-lb. wooden kegs.





SOUTHERN PINE PAPER

PROCESS for adapting young southern pines to production of white paper. Developed by Dr. Charles H. Herty, in cooperation with Castania Paper Co. in the case of sulphite cooking, and with Carolina Fiber Co. in the case of groundwood. Semi-commercial scale research carried out in Pulp & Paper Laboratory of Industrial Committee of Savannah. Results obtained on semi-plant scale with standard equipment, not yet in commercial practice.

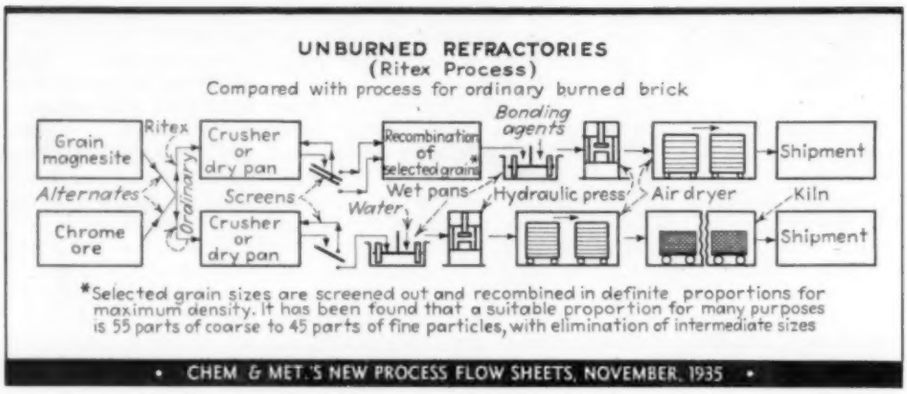
Newsprint of commercial standards has been made from pulp. From bleached sulphite, book and bond papers have been made; from further purified bleached sulphite, rayon pulp has been prepared of higher than normal alpha cellulose content. Proved suitable for preparation of viscose solution. Low cost of wood, proximity to all raw materials and mild climate enabling year-around logging, results in estimated costs of such pulps and white papers much lower than prevailing industrial costs.

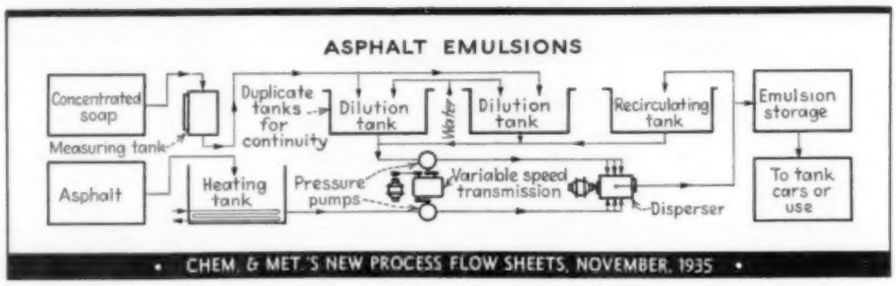
Southern pine heretofore considered unsuited to white paper manufacture, because of yellow-colored lumber there-

from, and supposed large content of resin. Analysis of sapwood, however, shows very low resin content and digestion of sapwood easily produces light-colored sulphite pulp.

By use of suitable type of stone surfaces and grinding at higher pressures and temperatures than usually practiced with spruce, light-colored groundwood with excellent properties produced. Gum wood —black, tupelo and sweet gum —sulphite pulps well suited for mixture with prime sulphite for book-paper manufacture.

In sulphite cooking, temperature brought to 110 deg. C., in 3 hours and then to 150 during about 8 hours further cooking. Both news sulphite and easy-bleaching sulphite have been made. For groundwood, conditions must be held within rather narrow limits. Proper surfacing of Carborundum stone made with light patterns applied with steel burr, nine to ten grooves per inch, with long lead. Pressure 45 to 48 lb. per square inch, temperature about 85 deg. C.


UNBURNED REFRACTORIES
(Ritex Process)
Compared with process for ordinary burned brick
Grain magnesite
Ritex
Crusher or dry pan
Recombination of selected grains*
Bonding agents
Shipment
Alternates
Screens
Wet pans
Water
Hydraulic press
Air dryer
Kiln
Chrome ore
Crusher or dry pan
Shipment
*Selected grain sizes are screened out and recombined in definite proportions for maximum density. It has been found that a suitable proportion for many purposes is 55 parts of coarse to 45 parts of fine particles, with elimination of intermediate sizes
• CHEM. & MET.'S NEW PROCESS FLOW SHEETS, NOVEMBER, 1935 •



UNBURNED BRICK

RITEX process for making unburned magnesite and chrome refractories developed by General Refractories Co. Exclusive operation in United States limited to this company's Baltimore, Md., works.

Permits manufacture of basic refractories without customary kiln-firing. Refractory bonding materials which develop high strength after 24 hours drying added to brick mix. Forming pressure for molding brick has been increased to 10,000 lb. per square inch. Brick pressed, using deairing equipment which subjects brick molds to vacuum during pressing operation.

Interfitting of grains has been developed to maximum by using only selected particle sizes, combined in proper proportions. Careful grain-sizing greatly intensifies effect of high molding pressure in reducing voids between grains. Brick have high strength, high density, improved resistance to spalling and are lower in thermal conductivity and gas permeability than regular burned basic brick.

ASPHALT EMULSIONS

PROCESS for producing emulsions and dispersions in liquid phase. Developed by Lancaster Processes, Inc., primarily for asphalt emulsions and cutbacks; has been applied to many emulsification problems, liquid phase dispersions and contacting.

First installed at Sone & Fleming refinery, Socony-Vacuum Corp., for producing asphalt emulsions for road building. Also used for wax emulsions, pharmaceuticals, lacquer emulsions, paper coatings. Process employs feed and initial dispersion of each raw material into separate streams of recirculating finished product, subjecting enriched and diluted streams when intermingled to extreme turbulence in a confined space. Method embodied in machine known as Lancaster disperser. Small quantity of material in process results in practically instantaneous dispersion, giving extremely fine and uniform particle size, highly efficient use of emulsifying agents, decreasing requirements of excess contacting reagents through rapidity of reaction. Disperser operates by turbulence in confined space, without close working clearances, requiring no operating adjustments. Power requirements small.

While disperser designed for continuous operation, is equally suitable for continuous or batch methods. For continuous operation disperser usually installed as shown in flow sheet of asphalt emulsion plant. Oil and water phases fed and proportioned by two feed pumps driven from constant and variable speed shafts, respectively, of variable speed transmission. Two supply tanks permit continuity of operation. Two units, each producing 3,500 g.p.h. of emulsions, run by one operator.

LACTIC ACID

CONTINUOUS fermentation process for production of lactic acid from whey, developed by Research Laboratories, Bureau of Dairy Industry, U. S. Department of Agriculture; now undergoing commercial, full-scale development. Commercial development, to be described when possible, may differ somewhat from following as described by government chemists, E. O. Whittier and L. A. Rogers (*Ind.Eng.Chem.*, 532, May, 1931).

Various organisms act on sugars to produce lactic acid. Lactobacilli such as *L. bulgaricus* and *L. casei* are advantageous. Skim milk treated with HCl to coagulate casein, separated whey at 43 deg. C. inoculated with active culture and agitated. At pH 5.0 lime fed to hold reaction between pH 5.0 and 5.8 (favorable range for culture). When fermenting whey contains less than 1 per cent lactose, in 48-72 hours after inoculation, whey feed started and volume rate regulated to equal fermenter volume each 24 hours. Lactic acid content kept between pH 5.0 and 5.8. Fermented whey continuously withdrawn, collected and at intervals boiled in coagulation tank until remaining protein completely coagulated. Lime added to complete production of calcium lactate or if lactic acid desired, sulphuric acid added to hot coagulated whey and coagulum and calcium sulphate filtered off together.

If calcium lactate is produced filtered solution evaporated to 25 deg. Bé., crystallized, broken up and dried. Some purification obtainable by lessening evaporation, cooling, crystallizing, centrifuging, washing crystals and returning mother liquor and washings to fermentation vat. When lactic acid produced, filtrate evaporated to desired con-

centration. (See flow sheet reproduced below.)

Acknowledgment hereby made to E. O. Whittier for supplying data on flow sheet together with labor estimate.

U.O.P. POLY PROCESS

PROCESS for production of gasoline with 82 or higher octane rating by catalytic polymerization of fixed gases normally generated in oil cracking operations; based on work of Dr. V. N. Ipatieff and developed by Universal Oil Products Co.

From 1,000 cu.ft. of gas, hitherto disposed of by burning under refinery stills and boilers, 3 to 6 gal. of high octane number motor fuel derived, having high "blending value," higher than benzol or iso-octane. Yield obtained depends upon fixed gas olefin concentration. Solid non-poisoning, phosphoric acid catalyst used with low cost regeneration *in situ*.

Now in use or under consideration by several larger oil companies to process about 35 million cu.ft. per day. Operates at low temperature and moderate pressure, permitting low installation and maintenance costs. (See flow sheet.) Process enters field of high demand for antiknock "blending fuels" where 300 billion cu.ft. of cracking still fixed gases are available per day.

HYMOLAL SALTS

RESEARCH work abroad and in U. S. during last five years produced entirely new detergents called "hymolal salts." Chemically, they are salts of sulphated high molecular weight alcohols. So far, sodium salts most practical. Are produced according to following process: Fatty acid, for example lauric acid, treated with hydrogen under extremely high pressure and in presence of catalytic agent. Lauric acid reduced to lauryl alcohol. This alcohol then sulphated by treatment with concentrated sulphuric acid. Lauryl acid sulphate then treated with sodium hydroxide to form neutral sodium salt. A sodium alkyl sulphate as illustrated by sodium lauryl sulphate being produced by Procter & Gamble under trade name of "Dreft." Is being marketed for domestic purposes, particularly where hard water is encountered. No insoluble curd or scum formed when Dreft is dissolved even in hardest water because calcium salt also soluble in water.

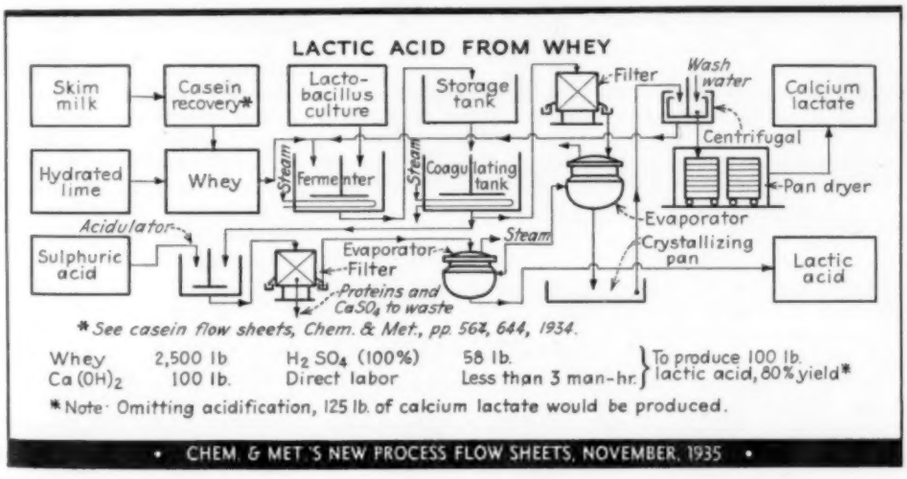
For industrial purposes Gardinol Corp. produces three types of sulphated derivatives of higher fatty alcohols derived from various oils and fats, e.g., fatty acids from coconut oil are reduced to technical grade of lauryl alcohol from which Gardinol WA is prepared by process previously outlined. Is quickly soluble and has powerful wetting, penetrating and scouring properties. Is stable under acid or alkaline conditions and in presence of many metal salts. Gardinol CA prepared from alcohols corresponding in properties to fatty acids derived from tallow. Is most effective for use at temperatures above 120 deg. F. Gardinol LS is highly refined type of alcohol sulphate developed especially for scouring raw wool and yarn. Will effect removal of grease and soil from all types of wool at 110 to 140 deg. F.

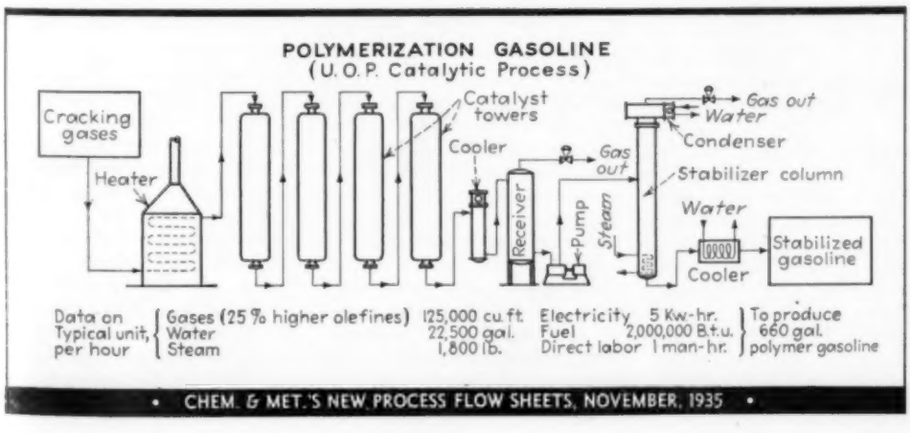
POLYMERIZATION PROCESS

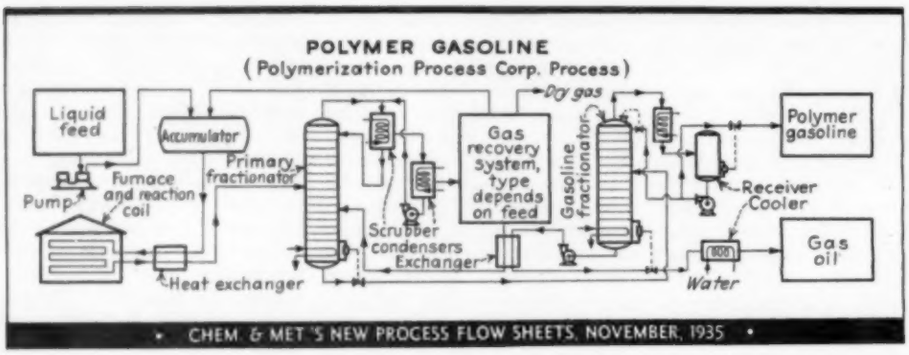
UNITARY process for the conversion of hydrocarbon gases to gasoline, developed by oil companies comprising Polymerization Process Corp., with M. W. Kellogg Co. licensing and construction agency. Present commercial plant producing normally 1,000 bbl. of polymerized gasoline from natural and refinery gases has been in successful operation over two years at Alamo refinery, Phillips Petroleum Co., Borger, Tex. Through exchange of patents, Texas Corp., Standard Oil Co. (Ind.) and Standard Oil Co. (N. J.), Phillips Petroleum Co., and M. W. Kellogg Co. have interest in new concern. Gasoline resulting from process is distinguished by high anti-knock value, high volatility and low gum content. Results show conversion of from 150 to 425 per cent of unsaturated hydrocarbons in feed and indicate direct juncture of saturated with unsaturated compounds.

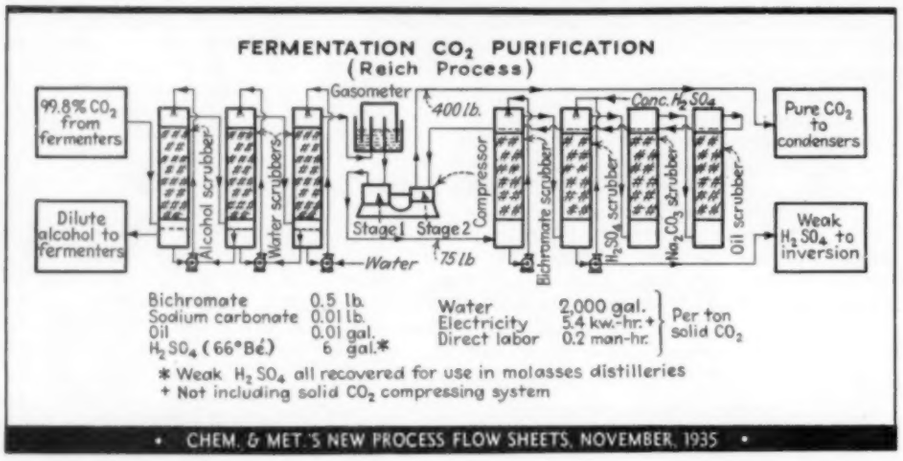
Process utilizes equipment similar in materials of construction and operation to conventional cracking unit equipped with efficient gas recovery and liquid stabilization equipment. May also be made part of existing cracking unit.

When charging stabilizer reflux containing 15 to 35 per cent (vol.) propylene and butylenes, liquid yields over 12 gal. (net) per 1,000 cu.ft. of gaseous feed obtained with either high or low volatility, having octane blending values from 80 to 120 (C.F.R.M.). When charging propane and butane process will produce 50 to 60 per cent (wt.) high volatility, low-gum motor fuel of same octane value as above. Cost of motor fuels made by unitary process varies with plant location but from charging stock evaluated at equivalent of 80 cents per barrel, plant de-









signed to produce 2,100 bbl. per day and located in South Mid-Continent area will give overall cost of polymerized gasoline estimated at about 3½ cents per gallon.

CARBON DIOXIDE PURIFICATION

CARBON dioxide gas can be continuously purified, whereby odorless, tasteless, bone-dry product obtained. Several plants now operating on process developed by Gustave T. Reich in 1922 have combined capacity of 400,000 lb. solid CO_2 daily. Process produced first solid CO_2 in ton lots. Gas from fermentation of grain or molasses has purity of 99.8 per cent carbon dioxide.

Flow sheet herewith, of latest modification, shows process in two parts—one preferably under 1 to 1½ lb. pressure, other under 75 lb. In first consisting of pressure regulating tank and three scrubbers, gas freed of alcohol content, water soluble and entrained materials. Alcohol yield of distillery thus increased ½ to 1 per cent. Scrubbing water containing alcohol used for make-up water in fermentation equipment.

Gas then collected in gasometer, then compressed in first stage to 75 lb. By cooling, large part of condensable organic impurities separate. Precooled CO_2 gas then deodorized and dehydrated by chemicals; first in bichromate scrubber, where oxidation of organic impurities takes place; then in sulphuric acid scrubber where oxidation and dehydration completed. In molasses distilleries weak sulphuric acid can be used for inversion, whereby acid consumption for purification is negligible.

Entrained sulphuric acid and oxidation products removed in scrubber containing coke coated with soda ash and second scrubber charged with limestone and odorless oil where organic oxidation products are completely removed.

Odorless oil reclaimed, used again.

Process requires no extra labor, operator attending compressing and liquefying system and taking care of purification. Repairs negligible, capital investment at least 50 per cent below that required for absorption system.

ELECTRIC FATTY ACID DISTILLATION

PROCESS for applying electric current to distillation. Developed by engineers of Woburn Degreasing Co. of N. J., to simplify distillation of fatty acids of high quality and uniformity.

Both batch and continuous stills developed. Among advantages is reduced time crude stock is subjected to distillation heat. Heat uniformly distributed by immersed resistance ribbons. Temperature differential between heating element and contacting crude very narrow, made possible by special distribution of scrubbing steam used in lowering vapor pressures. Overheating eliminated by this agitation and difference in temperature between heating element and body of crude not over 15 deg. F.

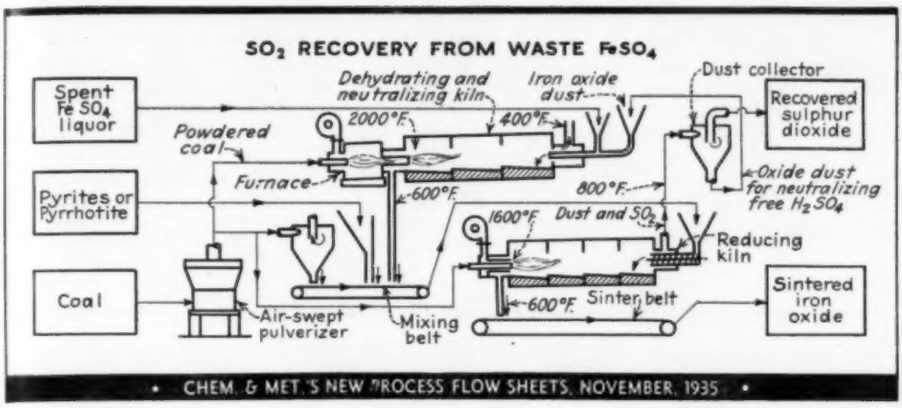
B.t.u. costs unquestionably higher, as compared with fuel oil operation, but many advantages offset this on year-around basis, for example, quick readjustment and wide selectivity of distillation conditions not readily obtained by other systems of heat input. Boiler steam at 110 lb. pressure also superheated by electric resistance trumpet, thermostatically controlled.

Thermostatic recording controls at numerous points of apparatus effect almost automatic operation of both types of unit. Various fatty acids deport themselves differently during distillation. Adjustments usually accomplished in about one hour, and distillation proceeds smoothly. Distilled vapors of fatty acids conducted only through stainless alloys and metals; products iron-free.

SULPHUR DIOXIDE RECOVERY

PROCESS developed by Chemical Construction Corp. for recovery of SO_2 from spent steel pickling liquors and other sulphuric end liquors containing from 1 per cent H_2SO_4 and 20 per cent iron sulphate up to 25 per cent H_2SO_4 and 20 per cent iron sulphate. First used by Titanium Pigment Co. in St. Louis and Sayreville, N. J., plants.

Where concentration of sulphate radical is low, necessitating considerable evaporation of water, process may be required only for disposal and nuisance avoidance. At higher concentrations, particularly iron sulphate, process as source of SO_2 may be competitive with natural sources, depending on location or tonnage factors. Process end liquor and iron oxide dust continuously mixed, evaporated and free acid neutralized in direct powdered-coal-fired multi-compartment rotary shell operated under temperature and concentration conditions promoting reaction to completion between oxide of iron and free sulphuric. Stack gases approximately 400 deg. F., and substantially anhydrous iron sulphate product at 600 deg. F. Latter mixed with pulverized coal for reduction, together with admixture of pyrites or pyrro-



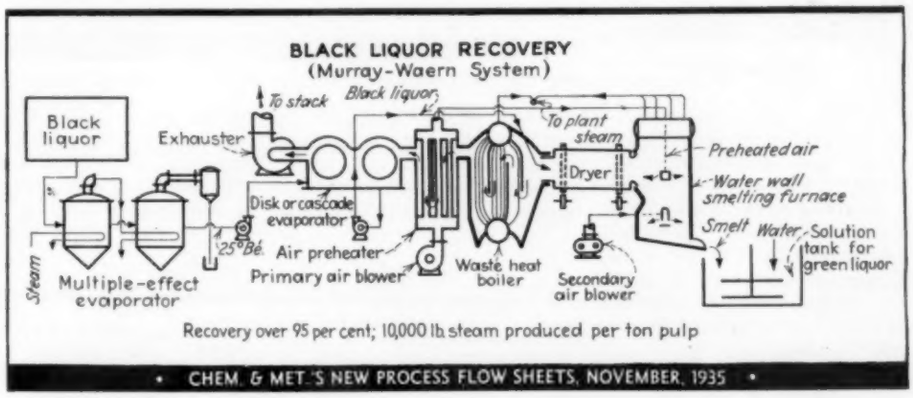
hotite to reduce coal required and add SO_3. Mixture continuously fed to second direct pulverized-coal-fired multi-compartment rotary kiln wherein sulphates are reduced and broken down to gaseous SO_2 and sintered iron oxide. SO_2 and oxide dust leaving kiln at 800 deg. F. pass through cyclone separator delivering oxide dust for first process step and clean SO_2 for catalytic conversion to SO_3 and sulphuric acid. Sintered iron oxide is suitable for (1) disposal, (2) use in blast furnace feed, (3) conversion to iron oxide pigment.

BLACK LIQUOR RECOVERY

PROCESS for recovering chemicals from black liquors in sulphate pulping process for paper pulp.

Developed and first installed at plant of Champion Fibre Co., Canton, N. C., by company, with Adolph Waern; improved by D. J. Murray Mfg. Co. and combined with improved waste-heat recovery by Combustion Engineering Co., present sales agents. Installed in several mills, operating on both northern and southern woods, recovering over 95 per cent of chemicals and producing about 10,000 lb. steam per ton pulp.

Black liquor evaporated to 25 deg. Bé. in multiple effect evaporators, then at 180 deg. F. passes to cascade or disk evaporator, heated by hot waste gases. Gases from latter evaporator to fan and stack at less than 250 deg. F., liquor to rotary dryer. Dehydrated, charred liquor from dryer discharges into smelter where sodium sulphate reduced at high temperature to sodium sulphide by organic content in combustion. Smelt flows to dissolving tank, hot combustion gases through dryer, waste heat boiler and air preheater to evaporator and stack. Air preheater supplies air for smelter, or air may be preheated in jacket around smelter. In first case, smelter has water walls for cooling and steam production.

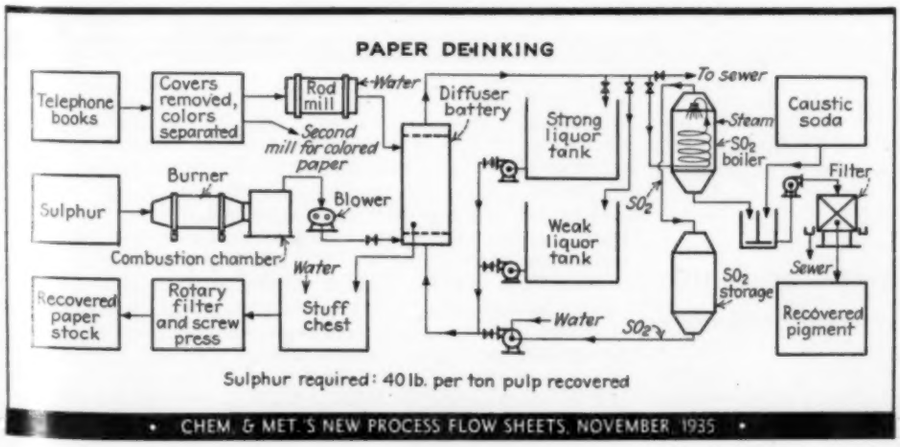


DE-INKING PAPER

PROCESS for de-inking paper printed with special ink, developed by Sidney D. Wells and used by Combined Locks Paper Co., Appleton, Wis. Ink developed by Hilton Davis Co.

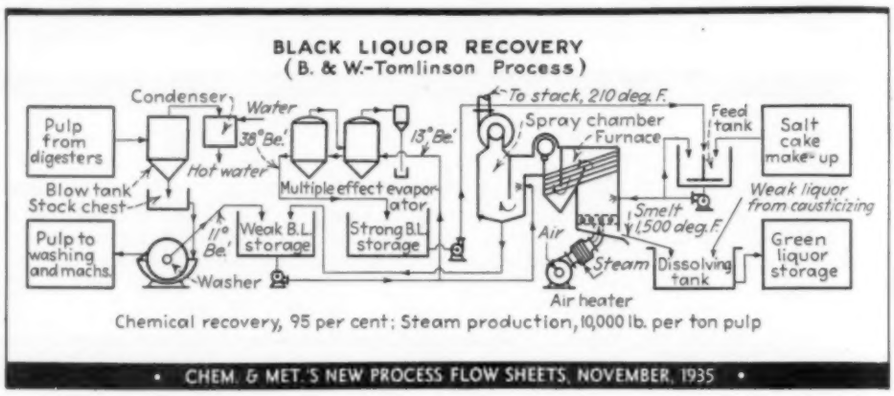
Process used on telephone books. Ink used, capable of discharging by acid solution and bleachable by oxidizing agents, employs iron lake of haematein (logwood) as pigment. Using process, together with telephone directory normal reclamation, complete economic cycle is established. Chemical cost for process under $1 per ton.

Covers and backs of books mechanically removed, colors separated and fed through two parallel rod mills (one for white and one for colored sections) wherein stock is nodulized in water to 80 per cent moisture content. Stock conveyed to diffusers consisting of wood tanks with screen false tops and bottoms. SO_2 gas first blown into bottom of loaded diffuser. Diffuser contents then treated with various liquors recovered from previous operation; with sulphited water employing recovered SO_2; and with wash water on schedule accomplishing complete solution



of pigment. Stock discharged to stock chest and diluted to 15-25 per cent density, then dried on rotary filter and in screw press. Is then ready for reworking on paper machine or to be run to laps for storage. Burning of 40 lb. of sulphur suffices for complete de-inking of each ton of stock.

Disposal of solution depends on SO_2 content. Strong liquors contain 6, weak liquors 4 grams SO_2 per liter. Liquors testing only 2 grams or less sent to sewer. Some strong liquor is stripped of SO_2 by steam and SO_2 stored to permit continuous operation with intermittent sulphur burning. Stripped solution neutralized with alkali and recovered pigment filtered out. (See *Chem. & Met.*, Dec., 1933, p. 634; Trans. T.A.P.P.I., Feb., 1934.)

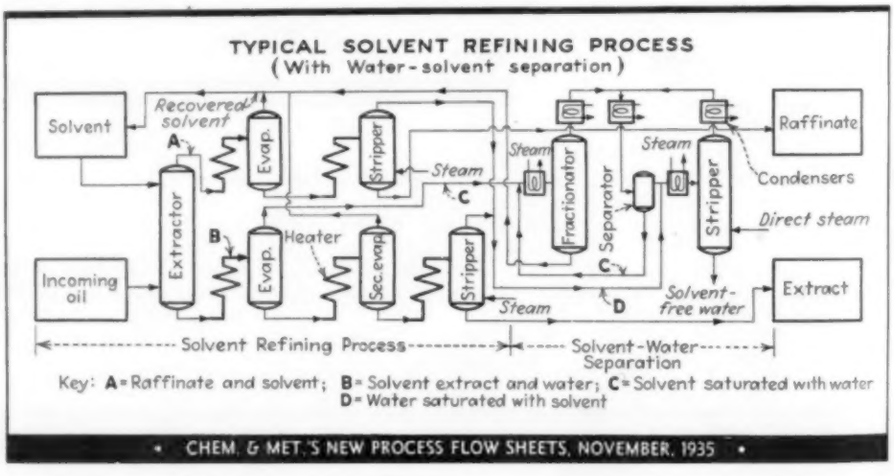


BLACK LIQUOR RECOVERY

PROCESS recovers chemicals and heat from black liquor; developed by George H. Tomlinson, of Howard Smith Paper Mills, Ltd., Montreal; first installed at Windsor Mills, Quebec, plant of Canada Paper Co. Makes substantial savings in cost of pulp produced by sulphate process.

B.&W.-Tomlinson recovery unit consists of a completely water-cooled furnace, over which is set standard B.&W. cross-drum boiler; behind which is located spray tower. Unit may also be equipped with superheater, economizer, and/or air heater for increased production of steam. Meters and controls for governing operation complete picture. Results include improved recovery of chemicals and maximum heat recovery, with minimum labor, maintenance and space. Average chemical reduction is 90 to 95 per cent and recovery of chemicals, 95. Unit delivers 10,000 lb. steam from and at 212 deg. F. per ton pulp. Operated by one full-time and one part-time man. Maintenance cost negligible, probably five cents per ton.

Operation as follows: Weak liquor from washers, at about 15 per cent solids concentration, circulated through spray tower, in contact with hot gases from boiler, becoming slightly concentrated. Then flows through multiple-effect evaporators where solid concentration increased to 55 per cent. Salt cake added and mixed with black liquor; mix sprayed into furnace under pressure through nozzle located in uptake wall. Horizontal spray of coarse particles impinges on side and rear walls of furnace. Particles dehydrated, accumulating as porous char to thickness of 12 in. Char breaks off and falls onto hearth in lumps, building up to level of primary air ports. Secondary air admitted above char. Smelt melts and flows to dissolving tank.



SOLVENT REFINING PROCESSES

TWENTY or more solvent extraction processes for producing high quality lubricants by removal of such materials as tar, resins, waxes from petroleum distillates developed by oil refiners in recent years. Principal selective solvents used commercially include acetone, aniline, benzol, dichloroethyl ether, cresylic acid, carbon tetrachloride, ethylene dichloride, furfural, methyl ethyl ketone, nitrobenzol, phenol, propane, sulphur dioxide and trichloroethylene, individually or in mixtures of two or more. (See *Chem. & Met.*, Feb., 1935, pp. 82-6, May, 1935, p. 243 and pp. 246-50.) Flow diagrams for each process differ in detail but essential steps are shown in typical flow sheet herewith.

Water, practically always present in commercial operation of solvent refining plants, must be removed to maintain desired selective properties of solvent and to avoid operating losses. Methods developed for separation of water and solvents depend on characteristics of solvents used and facilities available. In general, according to Smoley and Kraft of Lummus Co., (A.I.Ch.E. paper, Columbus meeting, Nov., 1935) fractional distillation methods appear most satisfactory because adaptable to nearly all solvent recovery systems and because refiner familiar with operation. Method described by W. K. Lewis (U. S. Pat. 1,911,832) and shown herewith especially applicable where solvents form constant boiling mixtures with water, e.g., aniline, cresol, ethylene dichloride, furfural, nitrobenzol and phenol. Method provides fractionation in separate columns of solvent-water and water-solvent phases. Another method employs the "salting-out" process with NaCl or Na_2SO_4. Still another adds light distillate before distillation.

NEW PRODUCTS of the PROCESS INDUSTRIES

These new raw materials and new products have been produced by the process industries and made available during 1934-35. Here is to be found the chemical or trade name of the product, its composition or classification, the name of the company that introduced it, and the purpose or use for which it is intended. Products are arranged alphabetically. The compilation offers a reference source for the chemical engineer interested in "what's new" and "who makes it." Other recently published lists of new products include, the Chem. & Met. Directory of Plastics, which covers over 1500 products; the Chem. & Met. 1934-35 Directory of Materials, over 550 alloys and other corrosion resistant materials are listed; Ferrous and Non-Ferrous Alloys Classified by Composition, giving important data on 650 metals and alloys.

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Abopon, a water soluble resin. Glyco Products Co., New York, N. Y. Coating for paper, leather, etc.; adhesive.

Aceko Milling Black JC, a dye. John Campbell & Co., New York, N. Y. For textiles.

Acetoacetanilid, an intermediate. U. S. Industrial Alcohol Co., New York, N. Y.

Acetoacetanilide. Carbide & Carbon Chemicals Corp., New York, N. Y. Used in synthesis of dyestuffs.

Acele Diazo Black ASN, a developed dye. E. I. duPont de Nemours & Co., Wilmington, Del. For cellulose acetate.

Acele Orange 2R Pdr., a dye. E. I. duPont de Nemours & Co., Wilmington, Del. For textiles.

Acele Orange GR Pdr., a dye. E. I. duPont de Nemours & Co., Wilmington, Del. For textiles.

Acele Diazo Black RB, a dye. E. I. duPont de Nemours & Co., Wilmington, Del. For textiles.

Acele Diazo Black AD, a dye. E. I. duPont de Nemours & Co., Wilmington, Del. For textiles.

Acetamide, C. P., odorless. Niacet Chemicals Corp., Niagara Falls, N. Y. Uses: soldering pastes and fluxes; plasticizer; solvent; solubilizing dyestuffs; hygroscopic agent; textile bleach activator.

Acid Black NCB, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Acid Brilliant Red 4BL, a dye. National Aniline & Chemical Co., New York, N. Y. For textiles.

A C P 33 Rustproofer, a rustproofing paint. American Chemical Paint Co., Ambler, Pa.

Adachrome Super Cement, a refractory cement. Botfield Refractories Co., Philadelphia, Pa.

Age-Rite HP, an anti-oxidant. R. T. Vanderbilt Co., New York, N. Y.

Age-Rite Syrup, a ketone-amine reaction product. R. T. Vanderbilt Co., New York, N. Y. An anti-oxidant for rubber goods.

Aktivin-S. Aktivin Corp., New York, N. Y. Solubilizing agent for starch in sizing and finishing.

Algol Yellow GCWP Pdr., a vat dye. General Dyestuff Corp., New York, N. Y. For textiles.

Algol Brilliant Green 5GA Pst. Fine, a vat dye. General Dyestuff Corp., New York, N. Y. For textiles.

Alizarol Yellow 2GN, a mordant acid dye. National Aniline & Chemical Co., New York, N. Y. For textiles.

Alizarine Red R 20% Paste, a mordant dye. E. I. duPont de Nemours & Co., Wilmington, Del. For textiles.

Alizarine Blue Black BG, a mordant acid dye. E. I. duPont de Nemours & Co., Wilmington, Del. For textiles.

Alkanol B. E. I. duPont de Nemours & Co., Wilmington, Del. Wetting agent for textiles and paper.

Alsimac, steatite. American Lava Corp., Chattanooga, Tenn. An insulating material.

Altazine Black OB, a direct and developed dye. Althouse Chemical Co., Reading, Pa. For textiles.

Altochromate Brown L, a mordant acid dye. Althouse Chemical Co., Reading, Pa. For textiles.

Aluminum Sulphate, dehydrated, 27% Al_2O_3. Grasselli Chemical Co., Cleveland, Ohio. For pharmaceuticals and cosmetics.

Amanil Brown CA, a direct dye. American Aniline Products Co., New York, N. Y. For textiles.

Amanil Catechine 3G, a direct dye. American Aniline Products Co., New York, N. Y. For textiles.

Amanil Developed Black BH, a direct and developed dye. American Aniline Products Co., New York, N. Y. For textiles.

Amanil Naphthol AS-BS, a dye. American Aniline Products Co., New York, N. Y. For textiles.

Amanthrene Blue RCL Dbl. Pdr., a vat dye. American Aniline Products Co., New York, N. Y. For textiles.

Amanthrene Brilliant Violet RR Dbl. Pdr., a vat dye. American Aniline Products Co., New York, N. Y. For textiles.

Amanthrene Dark Blue BO Dbl. Pdr., a vat dye. American Aniline Products Co., New York, N. Y. For textiles.

Amanthrene Navy Blue BN Pdr., a vat dye. American Aniline Products Co., New York, N. Y. For textiles.

Amanthrene Yellow G Dbl. Pdr., a vat dye. American Aniline Products Co., New York, N. Y. For textiles.

Amalthion Green YS 200% Copper Free, a sulphur dye. John Campbell Co., New York, N. Y. For textiles.

Amheral, a resin. Resinous Products & Chemicals Co., Philadelphia, Pa.

Amidazo Dark Brown G, a dye. John Campbell & Co., New York, N. Y. For textiles.

Amidazo Dark Brown M, a dye. John Campbell & Co., New York, N. Y. For textiles.

Ammonium Palmolate Tech., an emulsifying agent. Glyco Products Co., New York, N. Y.

Ammonium Persulphate. Pennsylvania Salt Manufacturing Co., Philadelphia, Pa. Weed eradicant.

Ammonium Sulphocyanate, a byproduct of coke manufacture. American Cyanamid Co., New York, N. Y. Weed eradicant.

Ammonium Sulphocyanate, a byproduct of coke manufacture. Koppers Products Co., Pittsburgh, Pa. Weed eradicant.

Ammonium Sulphate, 99.9% ammonium sulphate. Grasselli Chemical Co., Cleveland, Ohio. For serums for medicinal use.

Amolastic, an asphalt emulsion. American Oil & Disinfectant Co., New York, N. Y. For repairing and resurfacing floors.

NEW PRODUCTS OF THE PROCESS INDUSTRIES

Amyl Propionate, a high-boiling solvent for nitrocellulose. U. S. Industrial Chemical Co., New York, N. Y.

Anthrafilt, a filtering medium. Hudson Coal Co., New York, N. Y.

Anhydrous Ferric Chloride. Pennsylvania Salt Mfg. Co., Philadelphia, Pa. For sewage coagulant.

Ansul Methyl Chloride, a refrigerant. Ansul Chemical Co., Marinette, Wis.

Anthra Cyanine Violet 4B, an acid dye. General Dyestuff Corp., New York, N. Y. For textiles.

Antifoam LF, an antifoaming agent. E. I. duPont de Nemours & Co., Wilmington, Del.

Antiscorch T, cadmium oleate dispersed on clay. E. I. duPont de Nemours & Co., Wilmington, Del. Rubber processing.

Aquamel, an emulsifying agent. Glyco Products Co., New York, N. Y.

Aquaresin GB, modified glyceryl borate. Glyco Products Co., New York, N. Y. Water soluble plasticizer, lubricant, textiles, cosmetics, paper, etc.

Aquaplex, a water resin emulsion. Resinous Products & Chemical Co., Philadelphia, Pa.

Aquarex F, sodium salt of isopropyl naphthalene sulphonic acid. E. I. duPont de Nemours & Co., Wilmington, Del. For rubber processing.

Aquarex D, a stabilizing and wetting agent. E. I. duPont de Nemours & Co., Wilmington, Del. For latex processing.

Aresket, wetting agent. Rubber Service Laboratories, Akron, Ohio. For rubber processing.

Aresklene, an emulsifying and wetting agent. Rubber Service Laboratories, Akron, Ohio. For rubber processing.

Areskop, an emulsifying and wetting agent. Rubber Service Laboratories, Akron, Ohio. For rubber processing.

Aridex WP. E. I. duPont de Nemours & Co., Wilmington, Del. Used for producing spot-proof and water-proof fabrics.

AXF, an elastic plastic. U. S. Rubber Co., New York, N. Y. Compounding ingredient for natural and synthetic rubber.

Bakelite-Rogers Board, fibrous materials treated with Bakelite. Bakelite Corp., New York, N. Y. For molded products.

Bakelite-Rubber Compound. Bakelite Corp., New York, N. Y. Brake linings, clutch facing, etc.

Barrett Pickling Comp. No. 91. Barrett Co., New York, N. Y. For pickling.

Barrett Pickling Comp. No. 93. Barrett Co., New York, N. Y. For pickling.

Barium Permanganate. Carus Chemical Co., La Salle, Ind.

Barak, di-butyl ammonium oleate. E. I. duPont de Nemours & Co. To activate acidic accelerators in rubber compounding.

Barium Fluosilicate. Grasselli Chemical Co., Cleveland, Ohio. For antiseptics, ceramics, insecticides.

Bar-Ox 97. Truscon Laboratories, Detroit, Mich. In corrosion resistant paint.

Beckolin, synthetic oil of fatty acids. Beck, Koller & Co., Detroit, Mich. For varnishes.

Beta-trichlorethane, a solvent. E. I. duPont de Nemours & Co., Wilmington, Del. For synthetic and natural rubber.

B-K Powder, germicide containing chlorine. General Laboratories, Madison, Wis.

Blackalum, activated aluminum sulphate. Industrial Chemical Sales Co., New York, N. Y. Used in sanitary engineering as a coagulant for treatment of water supplies; used in production of artificial ice and in treatment of industrial effluent problems.

Blister-Proof Micarta, phenolic laminated resin. Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. Heat resistant material for counters, etc.

Boron Carbide, abrasive and wear resisting material. Norton Co., Worcester, Mass. Used for drilling cemented tungsten carbide die nibs, nozzles for abrasive blasting, wire drawing dies, etc.

Boride Crystals, metallic boride. Colmonoy, Inc., Los Nietos, Calif. Used where ever boron and borides may be employed.

Brilliant Avirols, sulphated higher fatty alcohols. E. I. duPont de Nemours & Co., Wilmington, Del. Softening and finishing agent for rayon, cotton, silk, wool, paper and leather.

Butyl Benzoyl Benzoate, a plasticizer. American Cyanamid Co., New York, N. Y.

Butanol, a solvent. Franco-American Chemical Works, Carlstadt, N. J.

Butyl-Phthalyl-Butyl Glycolate. Monsanto Chemical Co., St. Louis, Mo.

Butyl Crotonate. Niacet Chemicals Corp., Niagara Falls, N. Y. For cellulose ester lacquers and emulsions; perfume bases.

Butyl Propionate, a high-boiling solvent. U. S. Industrial Alcohol Co., New York, N. Y.

Calgon, sodium hexametaphosphate. Calgon, Inc., Pittsburgh, Pa. For textiles.

Calcogene Blue BC6R, a sulphur dye. Calco Chemical Co., Bound Brook, N. J. For textiles.

Calcogene Bordeaux 6R, a copper containing dye. Calco Chemical Co., Bound Brook, N. J. For textiles.

Calcogene Brilliant Blue 3GB, a direct dye. Calco Chemical Co., Bound Brook, N. J. For textiles.

Calcogene Red Brown RCF, a dye. Calco Chemical Co., Bound Brook, N. J. For textiles.

Calcogene Olive Yellow CK Extra, a dyestuff. Calco Chemical Co., Bound Brook, N. J. For textiles.

Calcogene Blue BC2G, a dyestuff. Calco Chemical Co., Bound Brook, N. J. For textiles.

Calcium Permanganate. Carus Chemical Co., La Salle, Ind. For textiles, sterilizing water, disinfectant, dentistry.

Calcoloid Violet 6RP, a vat dye. Calco Chemical Co., Bound Brook, N. J. For printing trade.

Calcoloid Blue 2BD, a vat dye. Calco Chemical Co., Bound Brook, N. J. For printing trade.

Calcoloid Orange R, a vat dye. Calco Chemical Co., Bound Brook, N. J. For textiles.

Calcoloid Pink FF, a vat dye. Calco Chemical Co., Bound Brook, N. J. For textiles.

Calcoloid Scarlet 2GHN, a vat dye. Calco Chemical Co., Bound Brook, N. J. For textiles.

Calconese Scarlet GC, a dye. Calco Chemical Co., Bound Brook, N. J. For cellulose acetate textiles.

Calconese Yellow GC, a dye. Calco Chemical Co., Bound Brook, N. J. For cellulose acetate.

Calconese Orange 3RC, a dye. Calco Chemical Co., Bound Brook, N. J. For cellulose acetate.

Calconese Red 2BC, a dye. Calco Chemical Co., Bound Brook, N. J. For cellulose acetate.

Calconese Diazo Navy B, a dye. Calco Chemical Co., Bound Brook, N. J. For cellulose acetate.

Calcined Carbonate of Potash, potassium carbonate. Niagara Alkali Co., Niagara Falls, N. Y. For glass and chemical production.

Carbonate of Potash. Niagara Alkali Co., Niagara Falls, N. Y. For glass making.

Carbonate of Potash Liquid. Niagara Alkali Co., Niagara Falls, N. Y.

Carbanthrene, printing powders. National Aniline & Chemical Co., New York, N. Y.

Celite Filter-aid No. 521. Johns-Manville, New York, N. Y. For filtration of liquors, etc.

Celite No. 110, an inert for paint. Johns-Manville, New York, N. Y.

Cellitons Brilliant Yellow FF, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Cellitons Discharge Violet B, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Cerol TFS. Sandoz Chemical Works, Inc., New York, N. Y. For water-proofing textiles.

Certified Spheron, carbon black. Godfrey L. Cabot, Inc., Boston, Mass. For processing rubber mechanical goods.

Cerium Hydrate. Harshaw Chemical Co., Cleveland, Ohio.

Chroma. D. & R. Mfg. Co., Niagara Falls, N. Y. Cleaner and polish for chromium.

Chromotone. Mathieson Alkali Works, New York, N. Y. For rug cleaning.

Clear Acid Resisting Frit No. 924. O. Hommel Co., Pittsburgh, Pa. Used over colored porcelain enameled signs.

Coblac. Binney & Smith Co., New York, N. Y. A chip lacquer base.

Colloy-Wax, a synthetic wax. Beacon Co., Boston, Mass. Substitute for carnauba wax.

Colortread, portland cement. Tremco Mfg. Co., Cleveland, Ohio. Colors and fills concrete floor.

Coolite, a glass. Mississippi Glass Co., Morgantown, W. Va. For special purposes.

Corroflex, a wrapping. Sherman Paper Products Corp., Boston, Mass.

Colloidal Aluminum Linoleate. Colloids, Inc., Newark, N. J. For use in inks.

Cromodine, rust proofing. American Chemical Paint Co., Ambler, Pa.

Crystal-Tex, a wrapping. Hy-Sil Mfg. Co., Revere, Mass.

Curtasal. Winthrop Chemical Co., New York, N. Y. For salt-free diet.

Cyclohexane. Rohm & Hass Co., Philadelphia, Pa.

Deodorized Rape Seed Oil. Bisbee Corp., Philadelphia, Pa. For edible purposes.

Diazo Brilliant Blue BBLA, a developed color. General Dyestuff Corp., New York, N. Y. For textiles.

Diazos Indigo Sky Blue 3GLA, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Diazos Indigo Brown NRA, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Diazos Indigo Blue BRA, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Diagen Red AMX, an azoic dyestuff. E. I. duPont de Nemours & Co., Wilmington, Del. For textiles.

Diagen Red AR, an azoic dyestuff. E. I. duPont de Nemours & Co., Wilmington, Del. For textiles.

Diagen Scarlet AR, an azoic dyestuff. E. I. duPont de Nemours & Co., Wilmington, Del. For textiles.

Diagen Dark Brown AR, a stabilized azoic dye. E. I. duPont de Nemours & Co., Wilmington, Del. For cotton printing.

Dicalite Speedex, a filteraid. Dicalite Co., New York, N. Y.

NEW PRODUCTS OF THE PROCESS INDUSTRIES

Dicalite Speedplus, a filteraid. Dicalite Co., New York, N. Y.

Dicalite Speedflow, a filteraid. Dicalite Co., New York, N. Y.

Dicalite V Grade, a filteraid. Dicalite Co., New York, N. Y. For varnish industry.

Dicalite L Grade, diatomaceous earth. Dicalite Co., New York, N. Y. For paint industry.

Dicalite VF. Grade, a filteraid. Dicalite Co., New York, N. Y. For wines and fruit juices.

Diglycol Laurate, a non-hygroscopic oil. Glyco Products Co., New York, N. Y. Dry-cleaning soap; production of soluble oils, shampoos, etc.

Dispersaid X, an emulsifying agent. Binney & Smith Co., New York, N. Y.

Doler-Brass, copper, zinc and silicon. Doehler Die Casting Co., New York, N. Y. For die casting.

Dreft, a soapless soap. Procter & Gamble, Cincinnati, Ohio.

Dry-Tex-ol, a water repellent. Protexall Co., Philadelphia, Pa. For textiles.

Dugas. Kap Corp., Chicago, Ill. For fire extinguishers.

Dullit W. General Dyestuff Corp., New York, N. Y. Delustering rayon.

Dunlopillo, cellular rubber. Dunlop Tire & Rubber Co., Buffalo, N. Y. Cushions for automobiles, etc.

Duolene, a solvent. Reliance Chemical Products Co., Providence, R. I. For textile industry.

Duozinc. E. I. duPont de Nemours & Co., Wilmington, Del. Zinc cyanide plating process.

Duponols, sulphated higher fatty alcohols. E. I. duPont de Nemours & Co., Wilmington, Del. Used where high wetting, emulsifying and dispersing properties are required.

DuPont Radiator Cleaner. E. I. duPont de Nemours & Co., Wilmington, Del. For cleaning automobile radiators.

DuPont Plant Spray. E. I. duPont de Nemours & Co., Wilmington, Del. For spraying plants.

Duraplex, a resin. Resinous Products & Chemical Co., Philadelphia, Pa.

Durez 2260K Black, a phenolic resinoid. General Plastics, Inc., North Tonawanda, N. Y. Where finer types of moldings are required.

Durez No. 3973 Black, a phenolic resin. General Plastics, Inc., North Tonawanda, N. Y. For molding bottle caps.

Durez Resin 175, phenol-formaldehyde resin. General Plastics, Inc., North Tonawanda, N. Y. Used in conjunction with rubber for brake linings.

Durez 1606 Resin, phenol-formaldehyde resin. General Plastics, Inc., North Tonawanda, N. Y. Impregnating woven brake linings.

Dutox, barium fluosilicate. Grasselli Chemical Co., Cleveland, Ohio. An insecticide.

Dwin Maid, a water softener. Baldwin Laboratories, Sagerstown, Pa.

Dynax, a fuel. E. I. duPont de Nemours & Co., Wilmington, Del.

Dynol, a lubricant. E. I. duPont de Nemours & Co., Wilmington, Del.

Eel-Slip, asbestos-graphite-rubber. Johns-Manville, New York, N. Y. Bearing material for service under water.

E. & L. Moth Spray. Eavenson & Levering Co., Camden, N. J. For scouring wool.

Emulphor A Oil Soluble, an emulsifier. General Dyestuff Corp., New York, N. Y. For textiles.

Emulphor E I, an oily liquid. General Dyestuff Corp., New York, N. Y. For textiles.

Epsom Salts, magnesium sulphate. Warner Chemical Co., New York, N. Y. Pharmaceutical.

Erio Chrome Garnet L, a dye. Geigy Co., Inc., New York, N. Y. For textiles.

Erkalin, an emulsifying agent. Advance Solvents & Chemical Co., New York, N. Y.

Ethyl-Phthalyl-Ethyl Glycolate. Monsanto Chemical Co., St. Louis, Mo.

Ethyl Cellulose, cellulose ether. Hercules Powder Co., Wilmington, Del. A non-flammable material for films, lacquers and plastics.

Ethyl Benzoyl Benzoate, a plasticizer. American Cyanamid Co., New York, N. Y.

2-Ethyl Butyl Alcohol. Carbide & Carbon Chemicals Corp., New York, N. Y. Solvent in lacquers, in perfumes.

2-Ethyl Butyl Acetate. Carbide & Carbon Chemicals Corp., New York, N. Y. A solvent for nitrocellulose gums and resins; used in printing inks.

Ethyl Silicate. Carbide & Carbon Chemicals Corp., New York, N. Y. Preservative for hardening stone and arresting decay.

Ethylene Diamine. Carbide & Carbon Chemicals Corp., New York, N. Y. Organic synthesis such as medicinals, dyes, rubber accelerators.

Fabricated Filter Carbon. National Carbon Co., Cleveland, Ohio. For filtration.

Fastusol Brown L3KA, a direct color. General Dyestuff Corp., New York, N. Y. For textiles.

Fastusol Orange L3RA, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Fastusol Blue LFFGL, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Ferric Acetate Powder. Niacet Chemicals Corp., Niagara Falls, N. Y. Uses: source soluble ferric iron; for paints, soaps, pharmaceuticals; textile mordant; wood preservative.

Ferritrol No. 100, an inhibitor. E. F. Houghton & Co., Philadelphia, Pa. For pickling.

Flexoresins, synthetic resin. Glyco Products Co., New York, N. Y.

Floragard. Grasselli Chemical Co., Cleveland, Ohio. Protects flowers against disease.

Fly Ded, an insect powder. Midway Chemical Co., Chicago, Ill.

Ferro Columbium. Electro Metallurgical Sales Corp., New York, N. Y. Prevents intergranular corrosion and improves weldability of stainless steels.

Fumol Insecticide. Fumol Corp., New York, N. Y.

Furoyl Chloride, a dye intermediate. Hooker Electrochemical Co., New York, N. Y. For dyeing and inorganic synthesis.

Gallo Violet D, mordant dye. American Aniline Products, New York, N. Y.

Gallopont Blue B, basic dyestuff. E. I. duPont de Nemours & Co., Wilmington, Del.

Gallopont Blue R, basic dyestuff. E. I. duPont de Nemours & Co., Wilmington, Del.

Gallopont Brown B, basic dyestuff. E. I. duPont de Nemours & Co., Wilmington, Del.

Gallopont Gray N, basic dyestuff. E. I. duPont de Nemours & Co., Wilmington, Del.

Gap. Pawley Chemical Co., Cohoes, N. Y. Polishing and cleaning for enamels, etc.

Gardinols, sulphated higher fatty alcohols. Gardinol Corp., Wilmington, Del. Processing textiles.

Gastex, carbon. General Atlas Carbon Co., New York, N. Y. For rubber processing.

Glyceryl Mono Stearate, an emulsifying or thickening agent. Glyco Products Co., New York, N. Y. For textiles, cosmetics, etc.

Glycosterin Odorless, glycol stearate. Glyco Products Co., New York, N. Y. Non-alkaline thickening and emulsifying agent for textiles, cosmetics, polishes.

Grasselli Fire Retardent. Grasselli Chemical Co., Cleveland, Ohio. Textiles; wood and paper products.

G-25, insulating fire brick. A. P. Green Fire Brick Co., Mexico, Mo.

Hand-Klen. T. & T. Co., Peekskill, N. Y. No-water cleaner used as shampoo, vanishing cream, shaving cream.

Hanton. Hanton Co., Pleasantville, N. Y. Skin cream for industrial use.

Hercose C. Hercules Powder Co., Wilmington, Del. Protective coating base.

Hercosol No. 80, a solvent. Hercules Powder Co., Wilmington, Del. For lacquers.

Hercules Zinc Sulphide. Hercules Powder Co., Wilmington, Del. White pigment of high-hiding powder.

HiBlak. Binney & Smith Co., New York, N. Y. Coloring concrete.

Hommelaya, a porcelain enamel. O. Hommel Co., Pittsburgh, Pa.

Hydraphtal, a cleaner. E. I. duPont de Nemours & Co., Wilmington, Del. For scouring textiles.

Hydrated Carbonate of Potash. Niagara Alkali Co., Niagara Falls, N. Y. For glass and chemicals.

Ideal Perfect Seal. Ideal Commutator Dresser Co., Sycamore, Ill. Sealing gaskets and threads.

Indanthrene Yellow 7GK, a vat dye. General Dyestuff Corp., New York, N. Y. For textiles.

Indanthrene Printing Red Brown RR, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Indanthrene Printing Bl. TL Suprafix, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Indanthrene Printing Olive T, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Indanthrene Printing Khaki 2GA, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Indanthrene Printing Brilliant Green GG, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Indanthrene Yellow 6GD Suprafix, a vat dye. General Dyestuff Corp., New York, N. Y. For textiles.

Indium. Grasselli Chemical Co., Cleveland, Ohio.

Indium Oxide. Grasselli Chemical Co., Cleveland, Ohio.

Indusoil, a fatty acid. Industrial Chemical Sales Co., New York, N. Y. For cutting oils and greases; textile lubricant and soaps; metal and polish; de-inking.

Indur, a synthetic resin. Reilly Tar & Chemical Corp., Indianapolis, Ind. Laminating varnish and molding powder.

Iso-Amyl Propionate, a solvent. U. S. Industrial Alcohol Co., New York, N. Y.

Iso-Butyric Acid, a solvent. Shell Chemical Co., Pittsburg, Calif.

Iso-Butyl Propionate, a solvent. E. I. duPont de Nemours & Co., Wilmington, Del.

NEW PRODUCTS OF THE PROCESS INDUSTRIES

Isomerpin. E. I. duPont de Nemours & Co., Wilmington, Del. For scouring textiles.

Iso-Propyl-Chloride, an intermediate; solvent. Hooker Electrochemical Co., New York, N. Y.

Jack Frost. B. F. Drakenfeld & Co., New York, N. Y. Frosting and etching glassware.

Katalized Tung Oil. Beck, Koller & Co., Detroit, Mich. For paint industry.

Ketanol. E. I. duPont de Nemours & Co., Wilmington, Del. Softener for nitrocellulose plastic sheet.

Kelo, a powdered cleanser. Granell Products Co., New York, N. Y.

Kopol, No. 502, congo copal modified. Beck, Koller & Co., Detroit, Mich. Varnishes and enamels.

Kopol No. 501, fused copal. Beck, Koller & Co., Detroit, Mich. For varnishes and paints.

Kopol No. 500, esterified copal. Beck, Koller & Co., Detroit, Mich. For formulation of floor, rubbing and spar varnishes.

Korogel, polymerized vinyl halides. B. F. Goodrich Co., Akron, Ohio. A matrix material for coating of ceramic ware.

Koroseal, a vinyl halide polymer. B. F. Goodrich Rubber Co., Akron, Ohio. Rubber-like material with certain special properties.

Korolac. B. F. Goodrich Co., Akron, Ohio. Rubber-like; corrosion resistant coating for plating racks.

Lanaclarin LM, sulphated higher fatty alcohol. E. I. duPont de Nemours & Co., Wilmington, Del. For scouring.

Lanetic Waxes, synthetic waxes. E. I. duPont de Nemours & Co., Wilmington, Del. Production of emulsion polishes, cosmetics, textile finishes.

Latex Telloy. R. T. Vanderbilt Co., New York, N. Y. Improves curing and aging of low-sulphur latex compound.

Leophen B., cresol-free mercerizing assistant. General Dyestuff Corp., New York, N. Y. For textiles.

Leucosol Black BBD Dbl. Paste, a vat dye. E. I. duPont de Nemours & Co., Wilmington, Del. For textiles.

Leucosol Yellow K Paste, anthraquinone derivative. E. I. duPont de Nemours & Co., Wilmington, Del. For printing trade.

Lithoform. American Chemical Paint Co., Ambler, Pa. Used to make paint stick to galvanized iron.

Liquid Carbonate of Potash, potassium carbonate. Niagara Alkali Co., Niagara Falls, N. Y. For textile industry.

L Lea Compound. Lea Mfg. Co., Waterbury, Conn. For buffing or coloring.

Lo-Box. Mathieson Alkali Works, New York, N. Y. Bacteria control in dairy.

Loro, a spray. Grasselli Chemical Co., Cleveland, Ohio.

Lotol, processed latex. U. S. Rubber Co., New York, N. Y. Where latex is used.

Lucky Tub. Gleam Products Co., New York, N. Y. Porcelain and enamel cleaner.

Lumino, aluminum-bituminous paint. Koppers Products Co., Pittsburgh, Pa. For painting.

Luxene, denture material. Bakelite Corp., New York, N. Y.

L-W. Firecrete, light weight refractory concrete. Johns-Manville, New York, N. Y.

Lyol, solvent. Reliance Chemical Products Co., Providence, R. I. For textile industry.

MaFos, a cleaner. Mathieson Alkali Works, New York, N. Y. For dish washers.

Magic, a bleach. Magic Manufacturing Co., Charleston, W. Va.

Mannitol, hexahydric alcohol. Atlas Powder Co., Wilmington, Del. Textiles, paper, leather, synthetic resin, pharmaceuticals.

Melodine, iodine in glycerine. Melodine Products Co., Los Angeles, Calif.

Merpentine, pine oil derivative. E. I. duPont de Nemours & Co., Wilmington, Del. Wetting agent for textiles and leather.

Metal Cleaner. Trojan Product & Mfg. Co., Chicago, Ill.

Metanitrobenzoyl Chloride. Hooker Electrochemical Co., New York, N. Y. For dyes and intermediates.

Metbor, alkaline borate. American Potash & Chemical Co., New York, N. Y. Fungicide and cleaner for citrus industry, detergent.

Methyl Aceto-Acetate. Carbide & Carbon Chemicals Corp., New York, N. Y. Synthesizing organic chemicals, dyestuffs, pharmaceuticals.

Methyl n-Amyl Ketone, a solvent. Carbide & Carbon Chemical Corp., New York, N. Y. Used in lacquers, in resin finishes.

Methyl Cyclohexane. Rohm & Haas Co., Philadelphia, Pa.

Methyl Cellulose, cellulose ether. Hercules Powder Co., Wilmington, Del. Greaseproof, flavor-retaining, non-flammable film; unaffected by organic acids; emulsifying agent for oils, waxes and fats.

Methylphthalyl-Ethyl Glycolate. Monsanto Chemical Co., St. Louis, Mo.

Methyl Propyl Ketone, a solvent. Shell Chemical Co., Pittsburg, Calif.

Methyl Ethyl Ketone, a solvent. Shell Chemical Co., Pittsburg, Calif.

Metso 22, integral metasilicate detergent. Philadelphia Quartz Co., Philadelphia, Pa. Cleaning in dairies, packing plants, etc.

Metso 66, metasilicate. Philadelphia Quartz Co., Philadelphia, Pa. A cleaner for metals.

Metso 99, sodium silicate. Philadelphia Quartz Co., Philadelphia, Pa. Cleaning metals, textiles.

Micronex Beads, carbon. Binney & Smith Co., New York, N. Y. Rubber products.

Misco, glass. Mississippi Glass Co., Morgantown, W. Va. Wire glass.

MR-10, hard rubber. American Hard Rubber Co., New York, N. Y. Lining for tanks, etc.

Murex Electrodes. Metal & Thermit Corp., New York, N. Y. Used with high-strength steels.

Murex Special A, an electrode. Metal & Thermit Corp., New York, N. Y. For welding.

M-U-F, an antioxidant. U. S. Rubber Co., New York, N. Y.

National Alizarol Cyanine R C, a dyestuff. National Aniline & Chemical Co., New York, N. Y. Textile industry.

National Erio Fast Orange WS, a dye. National Aniline & Chemical Co., New York, N. Y. For textiles.

Nelgin, an emulsifying agent. Glyco Products Co., New York, N. Y.

Nelio Resin. Nelio-Resin Corp., Collins, Ga.

Neomerpin, a wetting and scouring agent. E. I. duPont de Nemours & Co., Wilmington, Del. For textile industry.

Neomerpin, V.D., wetting agent. E. I. duPont de Nemours & Co., Wilmington, Del. For dyeing, textile printing, paper industry.

Neomerpin N, naphthalene sulphonic acid, wetting agent. E. I. duPont de Nemours & Co., Wilmington, Del. For printing, dyeing.

Neotone T, a delusterant. E. I. duPont de Nemours & Co., Wilmington, Del.

Nevinol, a coal byproduct oil, a plasticizer. Neville Co., Pittsburgh, Pa. In lacquer, chlorinated rubber, plastics, fly paper, adhesive.

Nitramon, a blasting material. E. I. duPont de Nemours & Co., Wilmington, Del.

Octyl Acetate, a solvent. Carbide & Carbon Chemicals Corp., New York, N. Y. For lacquers.

Octyl Alcohol. Carbide & Carbon Chemicals Corp., New York, N. Y. Used in formulation of mist coats, brushing, dipping and stencil lacquers and baking finishes. Solvent for gums, etc.

Octyl Aldehyde. Carbide & Carbon Chemicals Corp., New York, N. Y. Used in chemical synthesis where an aldehyde is required.

Ondulum, modified vegetable gum. Glyco Products Co., New York, N. Y. Hair waving lotion.

Opalwax, a synthetic wax. E. I. duPont de Nemours & Co., Wilmington, Del. For paper sizing, floor covering impregnation, polishes, candles, carbon paper.

Owens-Illinois Glass Brick. Owens-Illinois Glass Co., Muncie, Ind. For building purposes.

Oxydiaminogen OTA, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

P.A.C., formaldehyde dust. Grasselli Chemical Co., Cleveland, Ohio. Soil treatment.

Palatine Fast Yellow E L, a dye. General Dyestuff Corp., New York, N. Y. Textiles.

Palatine Fast Red BEN, a dye. General Dyestuff Corp., New York, N. Y. Textiles.

Parafilm, a wrapping. Marathon Paper Co., Rothschild, Wis.

Paraxone, substituted hydroxybenzine. E. I. duPont de Nemours & Co., Wilmington, Del. Rubber processing.

P.C.P. Chemical No. 5, an organic intermediate. Pennsylvania Coal Products Co., Petrolia, Pa. Cracked gasoline stabilizer.

Pellet D, blasting powder. Hercules Powder Co., Wilmington, Del.

Pelocel, vegetable casing. Pelocel Products Corp., Brooklyn, N. Y.

Penacol, white, organic intermediate. Pennsylvania Coal Products Co., Petrolia, Pa. Rubber color stabilizer.

Penchlor, sodium silicate. Pen Chlor, Inc., Philadelphia, Pa. For cement industry.

Pentaerythritol, a plasticizer. Niacet Chemicals Corp., Niagara Falls, N. Y. Used in manufacture of detonator compounds.

Peregal O, leveling agent. General Dyestuff Corp., New York, N. Y. For textiles.

Permalux, D.O.T.G. salt of dicatechol borate. E. I. duPont de Nemours & Co., Wilmington, Del. Rubber processing.

Plastogen, a plasticizer. R. T. Vanderbilt Co., New York, N. Y. Rubber compounding.

Plexigum. American Window Glass Co., Pittsburgh, Pa. Used in laminated safety glass.

Plexite Safety Glass, a laminated safety glass. American Window Glass Co., Pittsburgh, Pa.

Pilcote, rubber hydrocarbon resin. Watson-Standard Co., Pittsburgh, Pa. Protective covering for metal, concrete, stone, masonry, wood and plaster.

Pliofilm, a wrapping. Goodyear Tire & Rubber Co., Akron, Ohio.

NEW PRODUCTS OF THE PROCESS INDUSTRIES

Pliolite, a resin. Goodyear Tire & Rubber Co., Akron, Ohio.

Pontacyl Violet 12B, an acid dyestuff. E. I. duPont de Nemours & Co., Wilmington, Del. For textiles.

Pontine, rubber fabric. E. I. duPont de Nemours & Co., Wilmington, Del. Upholstering fabric.

Pontol, denaturant for alcohol. E. I. duPont de Nemours & Co., Wilmington, Del.

Potassium Silicate Glass. Grasselli Chemical Co., Cleveland, Ohio. For cold glazes.

Potassium Silicate Solution. Grasselli Chemical Co., Cleveland, Ohio. 30°. Filler in soap, welding rod coating.

Pre-Mixt, acid and water-proof cement. U. S. Stoneware Co., New York, N. Y.

Preparakote, primer for automotive refinishing. E. I. duPont de Nemours & Co., Wilmington, Del.

Prestabit Oil V. General Aniline & Chemical Co., New York, N. Y. Used in dyeing and finishing.

Pro-Tek, vanishing cream. E. I. duPont de Nemours & Co., Wilmington, Del.

Protexall, water repellant. Simcoe Mfg. Co., Philadelphia, Pa. For textiles.

P.S.T., household and agricultural insecticide. Noxx Chemical Co., Columbus, Ohio.

Pump Packing. Greene, Tweed & Co., New York, N. Y. Pumps for handling food products.

Pynex. Floor cleaner. Chicago Sanitary Products Co., Chicago, Ill.

Pyrocatechol, organic intermediate. Pennsylvania Coal Products Co., Petrolia, Pa. Dyes and antioxidant.

Pyrocatechol—Sublimed. Pennsylvania Coal Products Co., Petrolia, Pa. Pharmaceuticals, organic intermediate.

Pyroflex, depolymerized colloidal resin. Maurice A. Knight, Akron, Ohio. Lining material for tanks, etc.

Rapidogens Scarlet I L, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Rapidogens Bordeaux I B, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Rapidogens Yellow 13G, a dye. General Dyestuff Corp., New York, N. Y. For textiles.

Relinus Paint, heat-resisting paint. Relinus Co., Hempstead, N. Y. For refractories.

Resibond, plywood glue. Bakelite Corp., New York, N. Y.

Retarder W, salicylic acid with dispersing agent. E. I. duPont de Nemours & Co., Wilmington, Del. Rubber processing.

Rezinels, synthetic resin. Glyco Products Co., New York, N. Y.

Reogen. R. T. Vanderbilt Co., New York, N. Y. Processing of rubber.

R.R.C. Drain Opener. Rex Products, Inc., Toledo, Ohio.

Rubalt R A, rubber and bitumen. Alfred Hague & Co., New York, N. Y. Protective coating.

Rubber Powder No. 58, rubber. Heveatex Corp., Melrose, Mass. Hard rubber molding.

Rubber Powder No. 194-G, rubber. Heveatex Corp., Melrose, Mass. For molding.

Rust-Eeter, a protective coating. Harrington Paint Co., East Cleveland, Ohio.

Rust-I-Cide, rust remover. Rusticide Products Co., Cleveland, Ohio.

Secondary Amyl Alcohol, a solvent. Shell Chemical Co., Pittsburg, Calif.

Secondary Butyl Alcohol, a solvent. Shell Chemical Co., Pittsburg, Calif.

Secondary Hexyl Alcohol. Standard Alcohol Co., New York, N. Y.

Self-Vule, rubberizing compound. Self-Vulcanizing Rubber Co., Chicago, Ill.

Shirlan D. E. I. duPont de Nemours & Co., Wilmington, Del. Mildew proofing of fabrics.

Smith Alloy No. 10; iron, chrome, aluminum. A. O. Smith Corp., Milwaukee, Wis. Heat-resistant alloy.

S O A, sucrose octa acetate. Niacet Chemicals Corp., Niagara Falls, N. Y. Uses: denaturant, plasticizer, anhydrous adhesive; transparentizing agent for paper.

Sodium Acetoacetate, a solvent. U. S. Industrial Alcohol Co., New York, N. Y.

Sodium Chrome Glucosate. D. W. Haering & Co., Chicago, Ill. Control of corrosion in brine systems.

Sodium Permanganate. Carus Chemical Co., La Salle, Ind.

Sodium Titanite. Harshaw Chemical Co., Cleveland, Ohio.

Solux, para-hydroxy-phenyl-morpholine. E. I. duPont de Nemours & Co., Wilmington, Del. Rubber processing.

Souittep, high and low-temperature insulation. George F. Pettinos, Inc., Philadelphia, Pa.

Sorb, refrigerator-deodorizer. Rocke International Corp., New York, N. Y.

Sorbitol, hexahydric alcohol. Atlas Powder Co., Wilmington, Del. Textiles, paper, leather, synthetic resin, pharmaceutical.

Soromine S G, finishing agent. General Dyestuff Corp., New York, N. Y. For rayon and textiles.

Spirit Ink Papers, a wrapping. Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.

Stacol, water-soluble resin. Glyco Products Co., New York, N. Y.

Superex, insulation block. Johns-Manville, New York, N. Y.

Superflex Lacquer No. 20914. C. W. Haynes Lab., Inc., West Springfield, Mass. For leather.

Sylphrap Old Gold, viscose. Sylvania Industrial Corp., Fredericksburg, Va. A wrapping material.

Sylphrap U V R, viscose. Sylvania Industrial Corp., Fredericksburg, Va. A wrapping material.

Sylphseal, viscose. Sylvania Industrial Corp., Fredericksburg, Va. Caps and bands for bottles, jars, etc.

Synthetic Resin 78 A. Manufacturers' Trading Co., Los Angeles, Calif. Varnishes.

Tam Hy-Opax, zirconium oxide. Titanium Alloy Mfg. Co., Niagara Falls, N. Y. Enamel finishes.

Tetra Sodium Pyro-Phosphate. Warner Chemical Co., New York, N. Y.

Temp-urd Wood, phenol-formaldehyde impregnated wood. Pyratone Process Corp., Chicago, Ill.

Tenite, cellulose acetate. Tennessee Eastman Corp., Kingsport, Tenn. For molding variety of products.

Thiokol C-103, poly-methylene polysulphide. Thiokol Corp., Yardville, N. J. Protection coating material.

Thiokol D, oil-proof synthetic rubber. Thiokol Corp., Yardville, N. J.

Ti-Bar, titanium barium pigment. Krebs Pigment & Color Corp., Wilmington, Del.

Ti-Cal, titanium calcium pigment. Krebs Pigment & Color Corp., Wilmington, Del.

Ti-Cal Ho, titanium pigment. Krebs Pigment & Color Corp., Wilmington, Del.

Titanox A, titanium dioxide. Titanium Pigment Co., New York, N. Y. For paint, rubber, paper, etc.

Titanox B, titanium barium pigment. Titanium Pigment Co., New York, N. Y. For rubber paint, paper, etc.

Titanox C, titanium-calcium pigment. Titanium Pigment Co., New York, N. Y. For rubber, paper, etc.

Titanox-L, lead titanate. Titanium Pigment Co., New York, N. Y. Paint, paper, ceramics.

Titanium Dioxide. American Zirconium Corp., Baltimore, Md. Paper, textile, rubber, paint industries.

Titanyl Sulphate. Grasselli Chemical Co., Cleveland, Ohio. Production of titanium compounds.

Toolweld. Lincoln Electric Co., Cleveland, Ohio. Welding electrode.

Tornesit, chlorinated rubber. Hercules Powder Co., Wilmington Del. For paints.

Tri-Clene, cleaning fluid. E. I. duPont de Nemours & Co., Wilmington, Del.

Turkelene, emulsifying agent. Glyco Products Co., New York, N. Y.

Unichrome Resist, stop off lacquer for chromium plating. United Chromium, Inc., New York, N. Y.

Urea. E. I. duPont de Nemours Co., Wilmington, Del. Textiles and plastic industry.

Urea. American Cyanamid Co., New York, N. Y. Textiles and plastics.

Vinsol, a resin. Hercules Powder Co., Wilmington, Del. Use in varnishes, lacquers emulsifying agent for asphalt.

Vitric-10, acid-proof cement. U. S. Stoneware Co., New York, N. Y.

Vit-Re-Pair, cement for repairing porcelain. Vitrowhite Co., Chicago, Ill.

Viv, carnauba wax emulsion. Paper Makers Chemical Corp., Wilmington, Del. A polishing wax for linoleum, rubber, tile asphalt, hardwood, etc.

Water Dilutable Bakelite Resins. Bakelite Corp., New York, N. Y. Varnishes; laminating sheet stock and rolled and molded tubing.

Waterproofed Silk Fabric. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Shower curtains, drapes and rainwear.

Waterproof W 559, water repellant. Jacques Wolf & Co., Passaic, N. J. For textiles.

Witol Wax, acid-proof linings. Adolphe Hurst & Co., New York, N. Y.

Wool Blue G N Extra, an acid dye. General Dyestuff Corp., New York, N. Y. For textiles.

Wool Fast Navy Blue FTLN, an acid dye. Geigy Co., Inc., New York, N. Y. For textiles.

751Z Dull Drying, wax emulsions. Glyco Products Co., New York, N. Y.

Z A M; zinc, aluminum, mercury; an anode. Hanson-Van Winkle-Munning Co., Matawan, N. J.

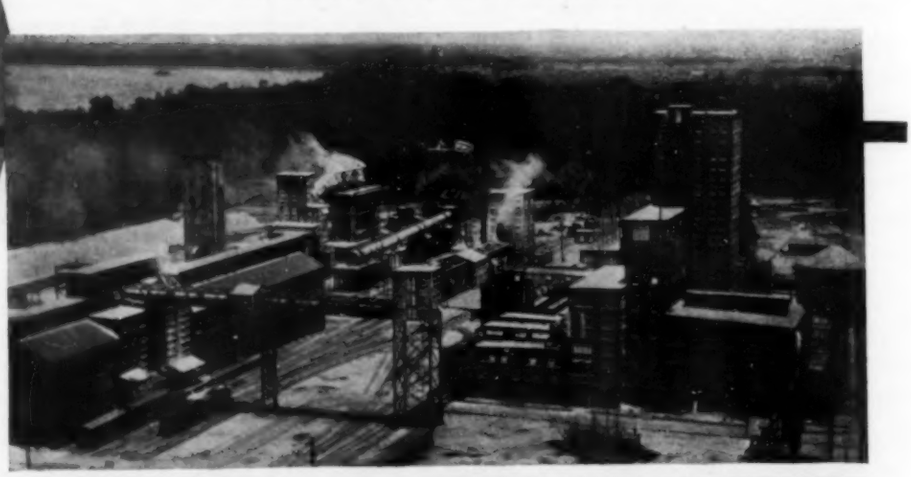
Zenite, zinc salt of mercaptobenzothiazole, accelerator, E. I. duPont de Nemours & Co., Wilmington, Del.

Zinc Oxide secondary zinc oxide. Superior Zinc Co., Bristol, Pa. For rubber, paint, etc.

Zinc Sulphide. New Jersey Zinc Co., New York, N. Y. For paper, paint, etc.

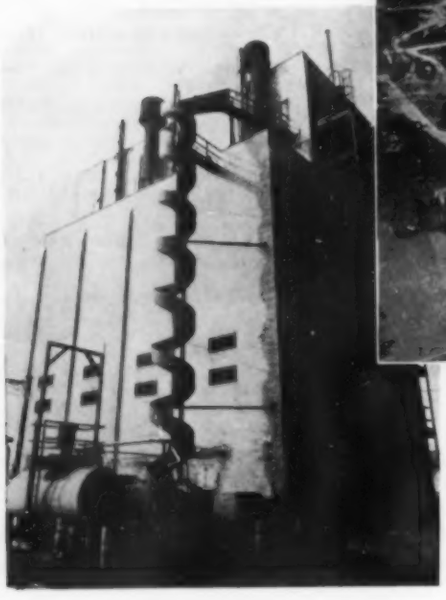
NEW PLANTS

Solvay Process at Baton Rouge, La.: Most recently completed of new alkali plants built to serve growing chemical industries of South and Southwest

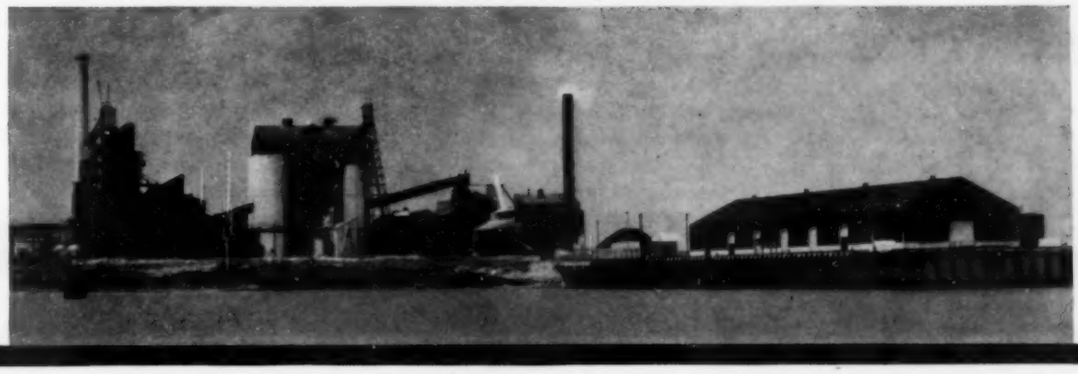


Novel engineering features distinguish the layout of Mathieson Alkali Works at Lake Charles, La. (center picture)

Unique, almost windowless design of new 5-story organic nitration building at duPont's Deepwater (N.J.) dyeworks (picture below)



Recently completed first unit of new plant of Krebs Pigment and Color Corp. on 100-acre site four miles north of Wilmington, at Edge Moor, Del. Titanium dioxide and new extended titanium pigments will be made here



Located on tidewater at Corpus Christi, Texas, Southern Alkali Corp. serves ocean-going vessels direct from own 400 ft. dock and turning basin.

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Modernism in appearance and design distinguishes this new plant of Titanium Pigments Co. at Sayreville, N. J.

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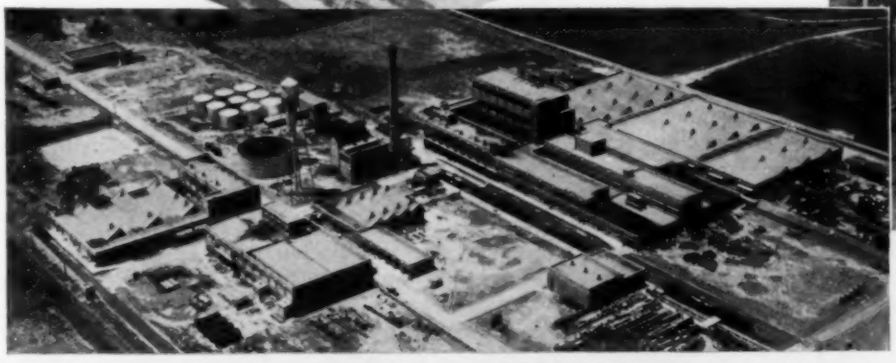
© Aerial Explorations, Inc.



Corner typifying recent construction program of Calco Chemical Co. now underway at Bound Brook, N. J.

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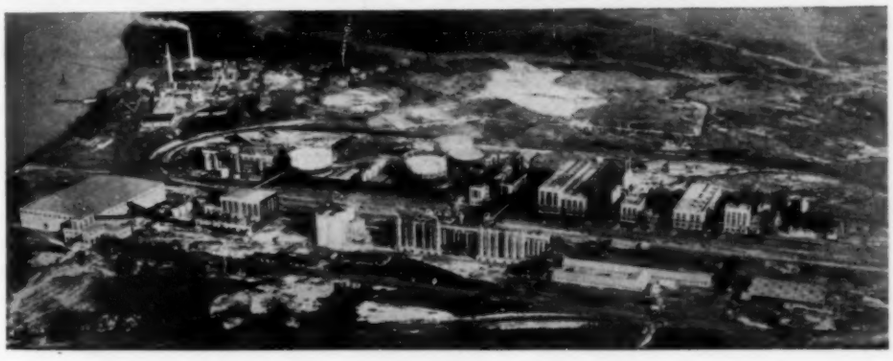

Bakelite is now celebrating silver anniversary in this new home, also at Bound Brook

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Million dollar addition to world's largest sodium nitrate plant at Hopewell, Va., just announced by Allied Chemical and Dye Corp. Nitrate and chlorine will be made directly from salt

These NEW PROBLEMS MANAGEMENT MUST FACE

By R. S. McBRIDE
Editorial Representative, Chem. & Met.
Washington, D. C.

Intermingling of economics and sociology with chemical engineering complicates the present situation confronting every technical executive

NEW PROBLEMS have arrived and will remain regardless of the future of the New Deal. The American people have for some time been ready for social advancement and the New Deal happens to be an instrument, not really the creator, of much of the change which is going on. Under these circumstances, it becomes a permanent part of the job of management to study and solve the resulting problems as rapidly as possible.

Much of the so-called "reform" movement has merely gained its momentum under New Deal leadership. Little of the development and few of the ideas are, however, strictly new. Most of the labor, marketing, price-control, and public-relations projects are only adopted children of the present Administration. However, these orphans have been given such a fine place at the family table and are so often favored beyond the customary stepchild, that misapprehension has been gained as to the origin of the changes which are being attempted.

Labor problems have been in the forefront of Washington controversy during the past two and a half years. They are, however, no more important to management of process industries than are the analogous changes going on in the fields of money, raw materials, marketing, and general public relations. It is essential that the broadest possible view be taken, even by the technical executive. Changing conditions which affect materials, man-hours, methods, or markets, all may, usually will, influence the relative merit of a given process or a given plan of operation.

The three major items of cost in a chemical process usually originate in payroll, cost of raw materials, and capital charges. The relative magnitude of these three elements of cost, as well as their absolute size, is important. Hence, when one of the three items of cost advances more rapidly or declines more abruptly than the others, the economics of the process may be thrown out of balance. Note three present trends.

1. At the present time, the cost of labor is steadily advancing. Furthermore, there is every reason to expect that the unit cost of a man-hour of given skill is going to increase in the future. No one can tell how fast nor how far this movement will go, but it is a movement which is as irresistible as the tide.

2. The cost of materials is likely to be relatively steady, or perhaps to decline a little under the competition between commodities for a new industrial market. Only in the case of agricultural raw materials need one anticipate any very great impulse from Washington toward further advances in prices, neglecting inflation, or another World War.

3. The cost of money to industry is declining. It is, according to the present trends, likely to be about half that of a few years ago.

It is important that management study these three changes and see what the cost movements relative to each other really mean. Only a few broad conclusions are worthy of note; but many important special conclusions will be discovered on careful analysis of any individual company project. Most important among the generalizations is probably the fact that further advance in the cost of the man-hour and decline in the cost of the dollar-year will accelerate mechanization. An example is worthwhile here.

If it were still a problem in sulphuric acid plants to determine whether the older chamber process or the newer contact process should be used, this change in the relative cost of labor and of money would have distinct application. In the old chamber construction, the high installation cost represented not high cost of money, but high investment of man-hours per unit of capacity. Increasing labor rates would, therefore, directly increase the capital cost more than enough to discourage the chamber builder, despite the cheapening of money which is an encouraging factor.

Generalizations, even on specific subjects like this, may be dangerous. Individual managements could doubtless find that there are still places where the particular local reasons justify the employing of lead burners in larger number for building these chambers. They might, in such cases, find the higher-paid lead burner cheaper than increased stock of platinum or vanadium catalysts. An accurate analysis of overall costs is essential to determine such competitive relationships. But for the present, the important thing is that the old units as to cost of money and cost of labor are changing. Conclusions based on them may, therefore, change very radically.

A study of such intra-process problems is very

definitely a job of the chemical engineer. He alone is able fully to appraise the economic impact of such changes. He alone can translate new payroll schedules and new money rates into cost estimates and make sound interpretation of the changes in processes that may be needed. But, unfortunately, a chemical industry executive cannot stop with those engineering tasks. He finds a larger problem of social engineering intermingled with his chemical engineering.

Very often it may be better to have the task of social engineering put under the charge of a special staff of people selected for their peculiar ability in dealing with these projects. More and more commonly, there is a personnel officer especially charged with the social problems of labor management; but the problems are by no means concentrated in the area of labor. They are almost equally numerous in the other fields of public relations.

It is not strange, therefore, that one large company in the chemical industry chose to call the group that handles many of these matters its "Department of General Affairs." The number of problems presented to the group is just as broad as the title indicates. And other companies have like problems even though they have not always designated any one department to handle them. But whether there be such department or not, the chemical engineer dare not forget the problems himself, nor ignore their technologic impact.

Washington is going to present during the coming winter another series of legislative problems on labor which will affect the chemical industry just as it does other divisions of business. For example, there is every expectation that the 30-hour week bill will again be pressed. Such legislation, when seriously considered by Congress, is rightly an occasion for business-man jitters. This bill has excellent opportunity for passage through the House of Representatives in a pre-election session of Congress. Its chances of enactment are dangerously good. In this situation one finds a splendid example of the reason for long range attention to social problems by chemical engineering executives. It will be wise to figure well in advance what one would do in his own plant should such law be enacted.

Most keen business men, by analysis of their own problems and by economic study, have reached the correct conclusion that such an arbitrary limitation of the working week is not a solution of the unemployment troubles of America. But the vast majority of voters has not studied this subject carefully enough, and has not been aided at all by those who have studied it. An amazing, if not dangerously, large percentage of the voters think, therefore, that the 30-hour bill might solve unemployment in their neighborhood. Naturally, then, they think their Congressman should vote for it; and the Congressman responsive to the wishes of the voters, as he should be, may be stampeded into a vote that has no real economic or social justification. The moral is, of course, that those who know the fundamental facts should have spread them more widely abroad.

Restriction of management judgment in dealing with employees is being freely attempted, especially in the Wagner Act administration; but fortunately the courts still say that the employer has a right to enter into contract arrangements with his staff, free from meddlesome officialdom at least in certain respects. One of the border-line questions still unsettled is how far the employer may influence the organization of his staff. Obviously the union executive wishes management entirely forbidden in this area. But it seems unbelievable that such restriction as is often proposed will be given legal sanction. Industry is not such a tyrant as to deserve a straight jacket. But to the extent that industry does not progress in technique along with the thinking of the day it jeopardizes its own opportunity for freedom of action within the natural field of management.

The public must understand that we need more economic development rather than arbitrary restriction of conditions of employment, if all are to again find a job at good pay. Process industry perhaps has less to fear in the movement toward legislative restriction of hours than do most other major divisions of manufacturing. But it is clear that if the other divisions of industry suffer, there will also be unfortunate effects on the chemical industry.

Tax consciousness is growing in America. The clamor against local sales taxes is but a small indication of rising of voters against those plans which will put new burdens on the public budget. If the New Deal is defeated in 1936 it will undoubtedly be because it has not adequately weighed the public objection to overgenerous spending. There is probably no other rock on the New Deal course sufficiently close to the surface to wreck that craft next year.

Politically keen minds of the Administration are beginning to sense this situation. There is very thorough basis for hope, therefore, that careless expenditures by the Federal Government may be curtailed. Budget balancing at an early date cannot be expected; but some conservatism is likely to come. All executives, including those in the chemical engineering field, can render a public service by clearly pointing out this situation and using every influence to accelerate the application of carefulness to public spending. That need not take a partisan political place to be effective in this matter. The greatest benefit of all will come as a sound tax concept is applied in State and subordinate jurisdictions.

New Forms of Taxation

Most distinctly of concern to chemical executives among the New Deal problems is that group of burdens which are in effect payroll taxes. This is a wholly new form of taxation, with consequences yet to be explored. All of the costs for unemployment insurance, for old age protection, and for other forms of social stability, bear only indirectly on the wage earner. No one should expect that the money is going to come out of the pay envelope. Wage earners will not get much, if any, less money currently because of these taxes. The money will eventually come out of what was formerly gross earnings. Hence, these obligations which are being assumed because of the public clamor for "security," will be either new cost burdens to be added to price or definitely a cause for shrinkage in profit.

From a chemical engineer's point of view it is easiest to think of security taxes as if they were 5 per cent to 10 per cent increases in total labor and salary costs. They have the same effect on expenses as would such change in wage and salary rates. The figure of 5 per cent is probably a conservative average to apply for the

next few years; and 10 per cent is none too high to apply for 1940 and beyond.

Chemical industry has generally a lower ratio of payroll to total cost of product than do many other divisions of manufacturing, textiles and steel for example. Hence, payroll tax burdens fall somewhat less heavily in terms of percentage of total cost. Nevertheless, the magnitude of the financial responsibility which is being placed on industry cannot be ignored, even by those branches of manufacture most favorably situated.

New Deal thinking goes even farther into the area of management when it undertakes to dictate the principles on which prices shall be fixed. There is no doubt in the mind of any clear thinker that the commodity price trends are downward as an incident to mechanization and as an essential prerequisite to defining standard of living. (Of course the unit used must be a dollar measure in some commodity form, not merely the currency dollar with all its vagaries and inflation factors.) Chemical industry has been more successful than most other divisions of manufacturing in steadily reducing its costs by improved technology and sharing the benefits of economy with the customer by lowered prices.

Many New Dealers do not think even this is enough. They would like, by some magic application of Federal control, to impose still further restriction. Many go so far as to say that the whole present profit system must be changed. Perhaps the chemical industry will escape most of the plagues of such ideas, since the industry makes producer goods, rather than consumer goods in most instances. But the fundamental underlying controversy is just as important in the heavy industries as in those which directly serve the householder.

Among the most dangerous, because most imminent, of the price control features being considered legislatively is that group which attempts to limit the effectiveness of chain merchandising establishments. Chemicals are not sold through chain stores, generally speaking; but legislation intended to regulate chains would, if enacted as proposed, actually regulate the chemical busi-

PROBLEMS IN MANAGEMENT

ACCEPTANCE OF REGIMENTATION

The willingness of any people to accept regimentation creates a lack of responsiveness to industrial leadership which is dangerous. It is expected and hoped, that this change in public philosophy will disappear as general spending power increases. A man with a plump purse rarely likes to be regimented.

GOVERNMENT IN BUSINESS

The tendency of the Government to go into activities competitive with business is a natural, in fact an almost inevitable, consequence of excessive Federalization of business police powers. It is most likely to occur, as most insidious in approach, when inspired by the relief motive. It is less probable when merely punitive in purpose; but even then is painful to management and potentially destructive of profit.

FEDERALIZATION

Paternalism at Washington has greatly accentuated the public's willingness to have Federal control supersede State and local management of affairs. For more than a decade before the depression the tendency, even of business groups, to run to Washington whenever relief of any sort was wanted, has culminated in the present Federalization of official activity and the concentration in Washington of many new functions, probably many that are at least extra-Constitutional. The States Rights issue will later, perhaps not soon, become the basis of corrective effort.

BIGNESS IS BADNESS

The President apparently believes that bigness in any business is socially dangerous. This conviction occasions much of his effort against holding companies of all types. Thus far, however, it has become an acute problem only with respect to public-utility holding companies. But if the New Deal leaders, especially the President, have their way, there will also be a like effort to destroy bigness in other business.

POWER POLICIES

The present effort to secure for the Federal Government more intimate control of hydro-electric power and water utilization is but the continuation of a trend extending backward two or three decades. It appears likely that this type of Federal control will be among the first to be recognized as legally within the scope of Federal domination. It will represent another step toward a more complete acceptance of the idea as to the breadth of the duty of sovereignty in matters affecting public welfare.

TENNESSEE VALLEY AUTHORITY

The TVA represents first of all a gratification of the President's desire for paternal service by the Government to the less favored units in population. Secondly, it is a punitive expedition organized against vulnerable public-utility groups. Thirdly, it is an effort to establish a yardstick for measuring believed merits of public ownership and public operation of power enterprises. The mixed motives which have originated and supported TVA account for the anomalous and mutually contradictory activities and policies exhibited by that Alphabetic agency.

BANKER BOSSING

A personal pique at bankers, apparently held by the President, has probably much accentuated his worthwhile and politically expedient effort to regulate banking; but, thus far, this effort has not extended to that feature of bankers' bossing of business which occa-

ness also. One such proposal that has had serious study in Congress would forbid discounts for quantity greater than a single carload. All clear thinkers wonder how so absurd a proposal as this can have serious attention; but so long as it does, it must be watched and suitable educational effort put forth to combat it.

Possibly one stage of greater absurdity has been noted recently among those economists who regard stability of price as an evidence of manipulative control. One group in official position even went so far as to conclude that the number of times the price of a commodity changed during the year was the best index of the freedom of competition in that business. Such folks are not economists, sociologists, or anything else deserving dignified and printable names. But they have influence.

One can hardly turn to any phase of human activity that he does not find new problems of technologic import arising. The Ethiopian conflict has accentuated a whole group of these affecting munitions control and war-time profits. The Hull-led program of tariff revision through bilateral treaties has created another source of foreign trade problems, as well as shivers of anxiety.

The NRA, which refuses to stay dead, is but another evidence of recurring problems that will not down, partly because of aggressive leadership in Washington, and partly because there is some real public (but not business) demand current in the nation for correction of certain evils. And unfortunately, the public often mistakes the proposed panaceas for real remedies. Also there are the questions of cheap power, and of regulations to force the cost of truck hauling up to that of over-regulated, over-capitalized railroads. The restriction of free speech (often a real threat in Washington) and a score of other big themes must be considered.

Mere recital of these is a catalog of national problems which are not going to be solved fully within the lifetime of most active chemical engineers and executives, much less within the range of a single administration. The acceptance of these problems as a part of the troubles of management seems inevitable.

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sionally afflicts process industry. Clear evidence shows, however, that when the banker bosses without risk, regardless of the business in which he then acts, his effort is going to be restrictive. Washington opposes that type of action. This does not mean, however, that bankers' participation in the planning and the prosecution of industrial enterprizes is either improper or likely to be unwelcome or illegal. The important distinction is that responsibility and authority must go along together. If they do not, bankers' authority is bound to be curbed by further legislation.

INFLATION

Inflation of many kinds has been forecast; but only that based on overexpanded credit and upon artificially stimulated prices for goods need be feared in the early future. These types are, however, likely as they may offset some effects of excessive spending and unbalanced budgets. In part, it is this prospect of inflation which makes money cheap. Two powerful groups, labor and agriculture, oppose inflation in most forms. Both groups stand to lose by it; but neither group will fight an inflationist who provides agricultural aid in money form and seems to be raising wages regularly for organized labor. Control will come only when voters become more tax minded than "benefit" minded. The normal social brakes on inflation are still slipping.

OFFICIAL IRRESPONSIBILITY

Carelessness in spending, certain irresponsibility in statements, destroying the sanctity of contracts, ignoring the accepted ideas of constitutional restriction, procedure without real plans, all have given the impression of irresponsibility among persons in high official position. Business-man jitters are the inevitable consequence. No obvious remedy, except new officials with greater sense of responsibility, appears on the horizon.

THE CONSTITUTION

Probably a much larger percentage of the population will follow a leader seeking to revise constitutional limits on Federal authority, than will follow any executive who seeks to ignore the constitution as currently in force. Present efforts to evade constitutional limits therefore are probably plowing fertile soil in which 1936 will plant seeds for constitutional changes. The business-man's problem in this situation is to limit changes in the constitution to those really needed. Effort will ultimately have to center on such changes as may give enlarged Federal authority for use only when the thoughtful *and deliberate* judgment of the people concludes that State and subordinate functioning is ineffective or inadequate on important public matters. Changing the constitution is a clear issue of immediate political—and business—significance.

OBJECTIVES vs. METHODS

Misconception on the part of business men regarding the trend of new Federal control has often originated in the technique used by New Dealers. For example, the Master New Dealer of them all, the President, has a most clever method of presenting objectives and plans as if they were proven methods of attack or accomplished policies. Hence, there has often been created in the minds of listeners equal confusion between objectives sought, usually more or less old, and procedures tried, often the most amateurish or ineffective. Unfortunately, those who have opposed the New Deal have not been much more clever than the average listener in making these distinctions. Hence, they have usually been unsuccessful even in keeping the effort toward good objectives within workable procedures. It is important that industrial management, taking a longer time view than do the politicians, should make this distinction.

EXTRA-LEGAL TAXES

The use of taxes as a weapon of disciplinary control is being frequently attempted. This is, to say the least, an extra-legal procedure. Its abandonment in the case of processing taxes under AAA or punitive taxes under the Guffey Coal Act would, of course, lead to a breakdown of fiscal program or a breakdown of the law's effectiveness, or both. If the Supreme Court follows tradition in these matters, as many lawyers anticipate, a new set of budget problems will arise when this kind of tax collection has been eliminated by the Supreme Court's findings. Business, a conspicuous group with cash on hand, may become the next tax-burden bearer under such circumstances. Business must improve its defense against confiscatory taxation.

NEW CONTAINERS

General all-rubber 13-gal. drums for hydrofluoric acid from Maurice A. Knight for Harshaw Chemical Co.

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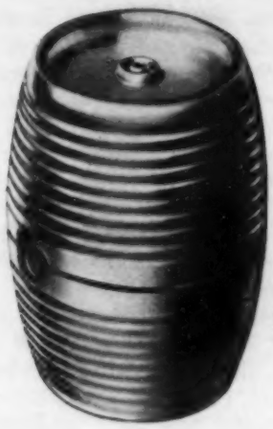

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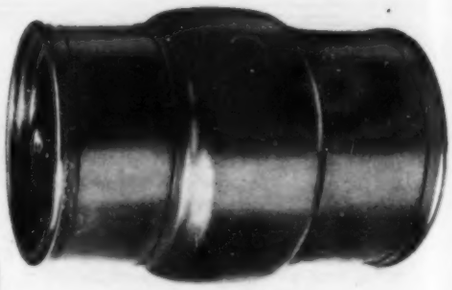

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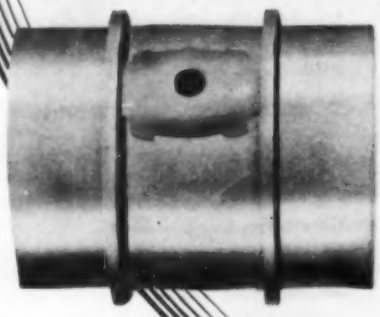

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1. Hackney double-walled, insulated steel beer barrel by Pressed Steel Tank Co.

2. Procter & Gamble's prize winning wood barrel with 4-piece quick removable head and curbed bilge hoops.

3. Steel beer barrel of A. O. Smith Corp. Note collar fabricated around center to facilitate handling.

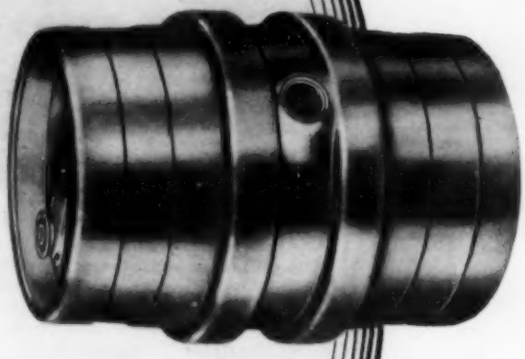
4. Aluminum Company's beer keg weighs only 21 lb. and said to require no lining to retain contents with color and taste unchanged.

5. Anhydrous ammonia gas cylinder of lower tare weight than usual 150 lb. container. Made by Pressed Steel Tank Co. to comply with I.C.C. 3 A-480.

Baking the linings into the Protectoline barrels of the National Steel Barrel Co. These are equipped with new tight-locking device.

FOR CHEMICALS

6



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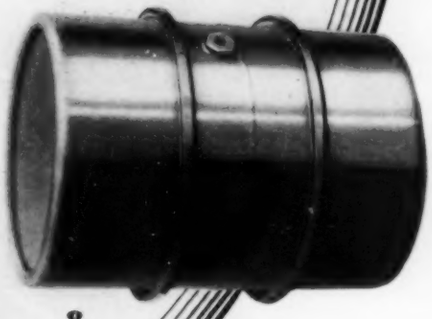

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6. Double shell insulated steel beer barrel with stainless steel lining made by Ingersoll Steel and Disc Co. under Krupp patents.

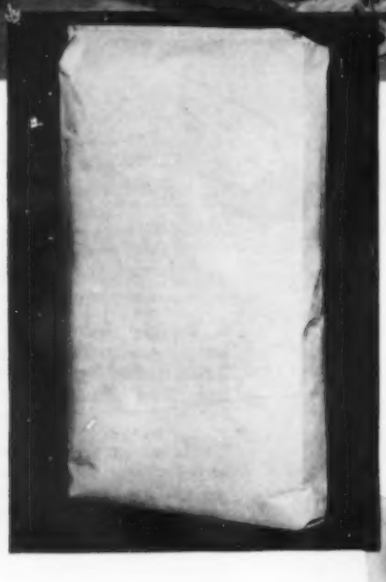
7. Never-leak steel barrel with heavy chimes and runners providing rugged construction. Made by Sturges Mfg. Co.

8. Two-piece acid drum of chrome-nickel steel or aluminum 110-gal. capacity, made by Pressed Steel Tank Co.

9. Patented type of 55-gal. rubber-lined solid head drum for muriatic and phosphoric acids. Made by U. S. Rubber Products, Inc. Note construction in two sectional units.

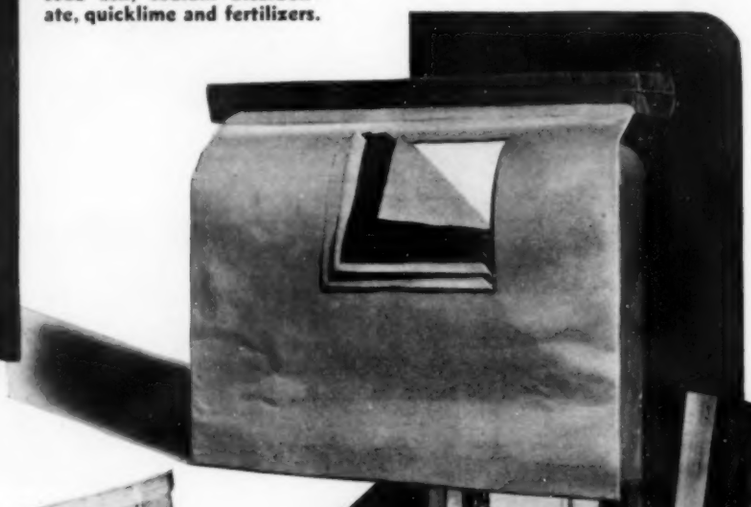
Filling, cleaning and handling sodium hypochlorite barrels in Pennsylvania Salt Mfg. Co. plant. Note detachable soft rubber linings developed by Goodall Rubber Co.

After paper valve bags are filled by automatic machines, sleeve of valve is turned over and tucked into valve proper, completely sealing the bag against sifting or absorption of moisture. Multi-wall paper valve bags are now used for alum, soda ash, sodium bicarbonate, quicklime and fertilizers.



These multi-wall paper valve bags are now used for alum, soda ash, sodium bicarbonate, quicklime and fertilizers.

Cross-sectional construction of typical moisture-proof bag such as used for calcium chloride. Asphalt laminated paper or moisture-proof Cellophane may be used.

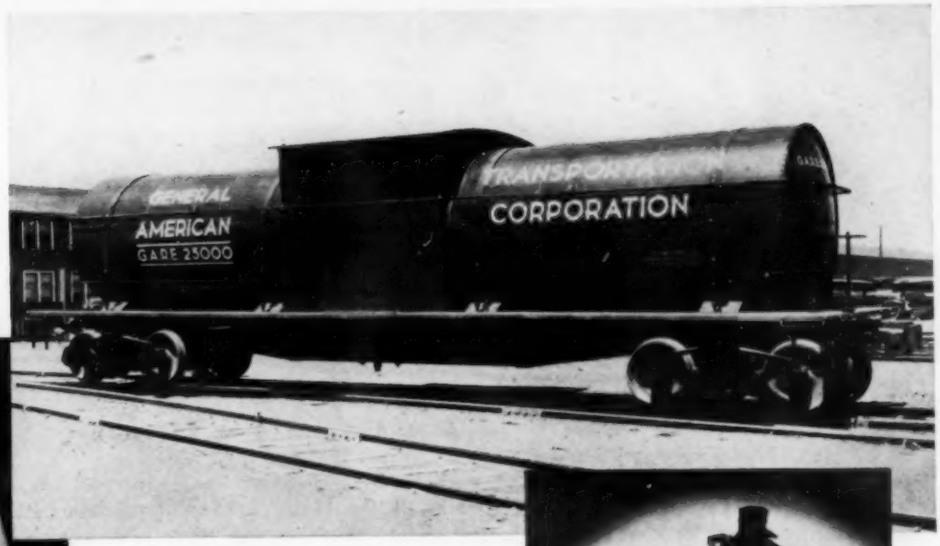


Prize winning paper bag developed by R. W. Lahey of the American Cyanamid Co.

This packing machine automatically fills and weighs three 98-lb. bags per minute. Filling is done through valve in corner of bag.

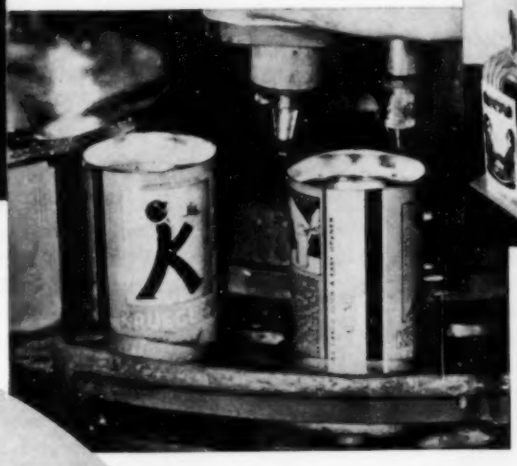
You may buy your motor oil in molded pulp bottles made by National Folding Box Co. with Scovill closure.

Canned beer is of chemical interest for the linings are of Vinylite resin.



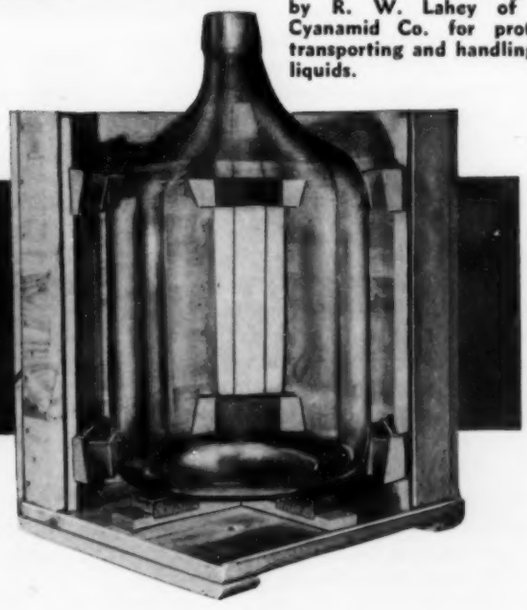
Six thousand gallons of "beverage" go places in this glass-lined tank car, insulated with 4-in. cork covering. Note armored steel cab to protect unloading connections.

These chemical engineering products are taxing the ingenuity and capacity of glass container industry.



One end of a 2-compartment car made entirely of aluminum with aluminum fittings.

Aero carboy and packing developed by R. W. Lahey of American Cyanamid Co. for protection in transporting and handling corrosive liquids.



Would NEW MONEY SOLVE YOUR PROBLEM?

AN EDITORIAL

SOME YEARS AGO "Boss" Kettering of General Motors pointed out that every industry needs research if it means to stay in business—much less keep in front of the procession. With tremendous strides being made in the chemical engineering field—with new processes, new products, entirely new ideas coming to life almost daily—it can be said truly that no industry can afford to overlook this all-important factor of research in the production of new ideas for modernizing existing plants and equipment. The thing that is sometimes lacking, of course, is the money to finance even a modest program of improvement.

Passage of the National Housing Act by Congress in the Summer of 1934 made available a new type of insured bank credit to the American people to finance the modernization of their homes and all other types of properties up to the limit of $2,000 for each property. The Federal Housing Administration, created to administer the Act, insured the banks and other private financial institutions against loss on these modernization and repair loans.

This new form of Government-insured credit became the foundation upon which a nation-wide modernization program was based, stimulating more than $950,000,000 of business since August of last year.

Early last Spring, it became apparent that thousands of commercial and industrial organizations wanted the same kind of Government-insured credit made available to them in order to finance more comprehensive modernization programs. Consequently, Congress amended the National Housing Act to provide for the same type of Government-insured credit up to $50,000 on certain types of income-producing properties. Included in the $50,000 classification is real property improved by or to be converted into manufacturing and industrial plants; and for the purchase and installation in such types of property, of such equipment and machinery as are ruled eligible by the Federal Housing Administration. All the money provided for modernization under this program is private capital. The Federal Housing Administration lends no money. But it makes private capital available to property owners through its insurance of the lending agency against loss up to 20 per cent of all insured credit it extends.

This immediately provided a great opportunity for plant modernization and the installation of equipment and improved production facilities and to promote the application of new chemical engineering processes.

The Federal Housing Administration has already approved many such loans providing for the installation and improvement of new industrial chemical processes and equipment. In many cases, unfortunately, those who had availed themselves of this opportunity, and are modernizing their plants with this new form of credit, are not willing to release details. Others that may be regarded as more or less typical include the following:

The Wiremold Co. of Hartford, Conn., has financed a plant consolidation program which enables it to combine all operations in one plant where heretofore they have been forced to carry on operations at two different plants in Hartford.

Beringer Brothers, Inc., proprietors of the Los Hermanos Vineyards at St. Helena, Calif., have financed the erection and equipment of a modern fermenting room and a new distillery building, which takes the place of structures and equipment that have been in use for 60 years.

The Stewart Paint Co. of Minneapolis, Minn., recently obtained modernization credit and added a large warehouse to its present factory. Because of this increase in the size of its plant, the company will now be able to enter into the manufacture of varnishes, which, company officials expect, will increase business approximately 40 per cent.

Engineers and executives in all plants in need of modernization may obtain, free of charge, from the Federal Housing Administration, Washington, D. C., a pamphlet, "Equipment and Machinery Eligible for Modernization Credit." This explains in detail the types of machinery and equipment which are eligible for financing under the revised Modernization Credit Plan of the Federal Housing Administration, and tells exactly how to get credit for these purposes. The process is simple. The applicant takes full details of the proposed modernization together with cost estimates and a credit statement to any financial institution having a contract of insurance with the Federal Housing Administration. This institution has full authority to arrange all details of the loan and to complete the loan without referring it to the Federal Housing Administration, keeping within the broad regulations made by the Federal Housing Administration to protect both lender and borrower.

The interest rate and other charges may be as low as the lender and borrower agree upon, but in no case can the total charges exceed the equivalent of a $5 discount per $100 original face amount of a one-year note. The note may run as long as five years, but must be repaid in equal monthly installments. The lending agency is advised to take collateral for the larger loans and is also cautioned against allowing credit which may burden the borrower in making repayments. One of the advantages of this long term credit is the fact that the borrower can keep his working capital intact and can repay the loan out of earnings.

NEW TRENDS, DESIGNS, EQUIPMENT AT THE CHEMICAL EXPOSITION

FOR THIS fifteenth Exposition of Chemical Industries, to be held in New York during the first week of December, *Chem. & Met.* has decided to alter its earlier reporting tactics, describing the new developments to be shown *before,* rather than *after,* the fact.

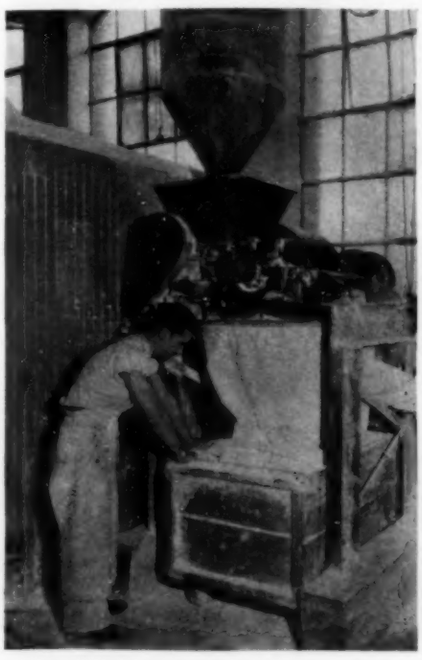
In making this effort toward advance description, we have requested and received the hearty cooperation of a majority of the exhibitors. Unfortunately, in certain cases, exhibits had not been decided upon at the time of our going to press, and it will be necessary to pick up what loose ends there are after the last exhibitor has folded his tent. In the pages that follow, however, although briefly, much that is new will appear for advance appraisal.

CRUSHING, GRINDING, HOMOGENIZING

EQUIPMENT in this classification will be well represented, with both new and redesigned machines. Abbé Engineering Co., New York, has developed an improved line of one-piece, all-steel ball and pebble mills, said to give increased capacity over the older style, as well as greater rigidity. In the smaller sizes a new drive is used, featuring gear-in-head motors, with roller chain transmission.

Bramley Machine Corp., New York, has for a number of years been supplying the Bramley mill to the paint, enamel and lacquer industry. With the coming Show the mill is to be introduced to chemical engineers in general for numerous grinding and dispersing applications. The machine appears in cut-away view on the following page. Dispersion or grinding of materials takes place in a stationary, water-cooled cylinder, the inner surface of which is formed of alloy steel lining rods, producing a corrugated grinding surface. Within the cylinder is a spider with heavy springs hinged to it, each spring carrying a longitudinal grinding blade. The spider also carries a concentric, floating ring to which are attached pressure pins bearing on the springs. In operation the spider revolves and with it the blades which are adjusted to bear upon the corrugated surface with the desired pressure. This pressure is adjustable by means of a hand wheel at the other end of the mill with which the relative position of the pressure pins and spider may be altered. Rotation of the blades results in a combination of hammering, rubbing, shearing and wiping.

Installation of new intermediate size Mikro-Pulverizer



Two new Mikro-Pulverizers will be shown by the Pulverizing Machinery Corp., Roselle Park, N. J. These mills are being produced in two new sizes, including a laboratory or small production machine for quantities ranging from ounces to several hundred pounds, and a new intermediate size. The latter incorporates several novel improvements which have been used in redesigning the company's entire line. Among these may be mentioned the fact that the main frame sections are now all cast in one piece, with corners and edges rounded. An improved outlet fabric attachment facilitates removal and replacement. A new locking device for the retaining screens makes changing easier and quicker.

The Bowl mill recently announced by Raymond Bros. Impact Pulverizer Co., Chicago, will be exhibited for the first time. The drawing on the following page shows a cross section of this mill close-circuited with a mechanical air separator. The axes of the rolls are stationary and the grinding chamber, or bowl, revolves around the rolls. A clearance is maintained between rolls and bowl and pressure is applied to the material being ground by heavy springs, the pressure of which is adjustable during operation. As material is ground it is carried up the side of the bowl by centrifugal force, discharging over the periphery and thence from the bottom

chute to the elevator. It is claimed that materials can be ground as fine as 95 per cent through 325 mesh or finer by this means.

Robinson Mfg. Co., Muncy, Pa., has redesigned its screen type pulverizer, simplifying its construction and employing a new feeder said to deliver material to the grinding chamber at exactly the rate required. This company's new disk grinder, shown herewith, used for grinding fine chemicals, cosmetics, dyes and pharmaceuticals, employs a built-in motor which is of the totally-enclosed, fan-cooled type.

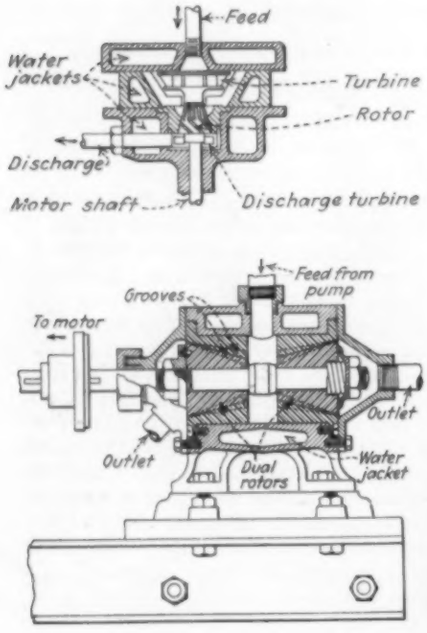
An entirely new type of grinding machine is the Gervais crusher, a machine developed in Canada and introduced into the United States by Dunscombe & Pooler, New York. A small model of this device, weighing only about 500 lb. but having a capacity of at least 1,000 lb. per hour from 1 in. to 20 mesh will be shown by Separations Engineering Co., New York. The crusher is a vertical cylinder containing three or more crushing wheels mounted on eccentrics on a concentric shaft. The lubrication is supplied by water passed through the shaft. The mill's operation can be controlled to produce any desired proportion of fines.

A number of new machines among the homogenizers and colloid mills will be on display. Manton-Gaulin Mfg. Co., Everett, Mass., has developed a laboratory homogenizer of the high-pressure pump type which is similar, except in size, to the production machine shown at the last Show. The new homogenizer will handle up to 25 gal. per hour on a continuous basis, or as little as a quart for sample purposes. Similar entry into the laboratory field, with a colloid mill of 1 to 10 gal. per hour capacity has been made by the Chemicolloid Laboratories, New York, with the introduction of its new Junior model Charlotte mill.

Since the showing at the 1933 Exposition of its first small colloid mill, Eppenbach, Inc., Long Island City, N. Y., has developed a number of new and interesting types. Mills for use on less viscous materials are generally similar in construction to the type B mill shown in the drawing. Mills of this type have recently been redesigned for water-cooling in three sections, as shown, with outside connections between sections. These mills employ a small turbine on the rotor shaft, both at the intake and at the discharge. The turbines pump material through the mill.

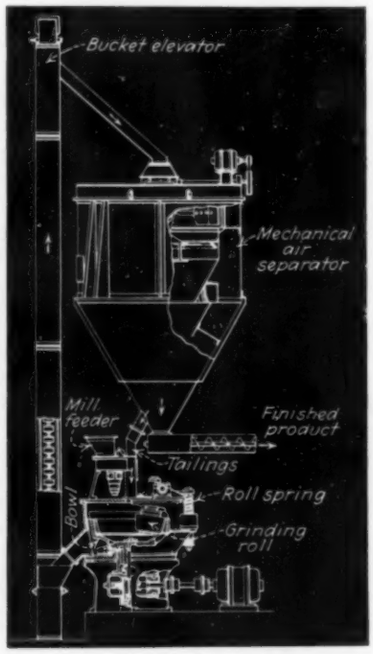
For more viscous materials the company has developed a new horizontal mill which is described as being, in theory, an internal roller mill. This is called the Dual Rotor mill and is shown in one form in one of the drawings at the left. In another modification a screw-type pump on the shaft between the rotors is used to supply the necessary pressure. In this mill the two rotors themselves act as the bearings. As the thrusts are equalized in operation, the rotors tend to float with suitable clearances.

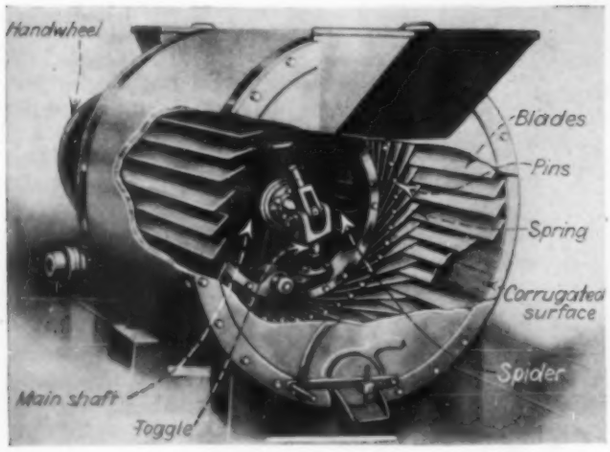
Two new Eppenbach colloid mills, the upper, the type B and the lower, the Dual Rotor mill



Gervais crusher, 1,000 lb. per hour capacity from 1 in. to 20 mesh

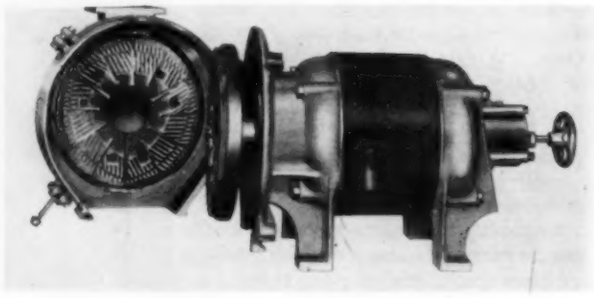
Raymond Bowl mill with mechanical air separator in closed circuit

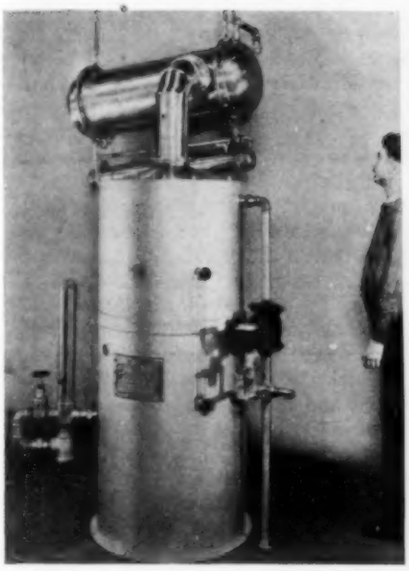


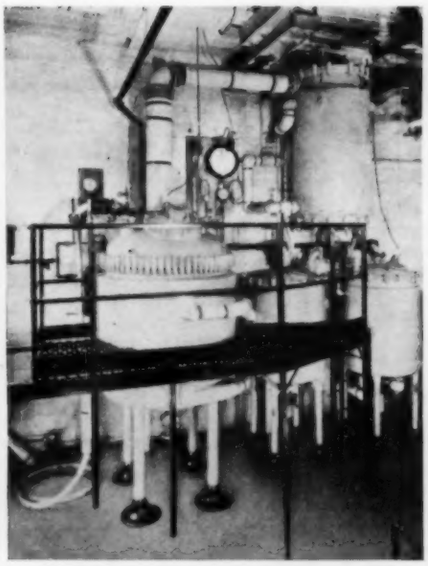


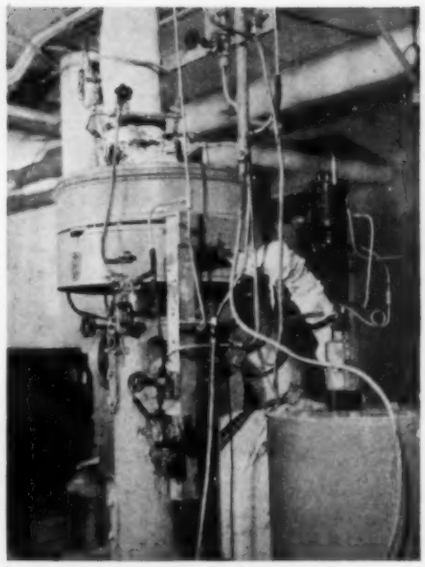
Left: Cut-away view of Bramley mill

Below: New Robinson disk grinder

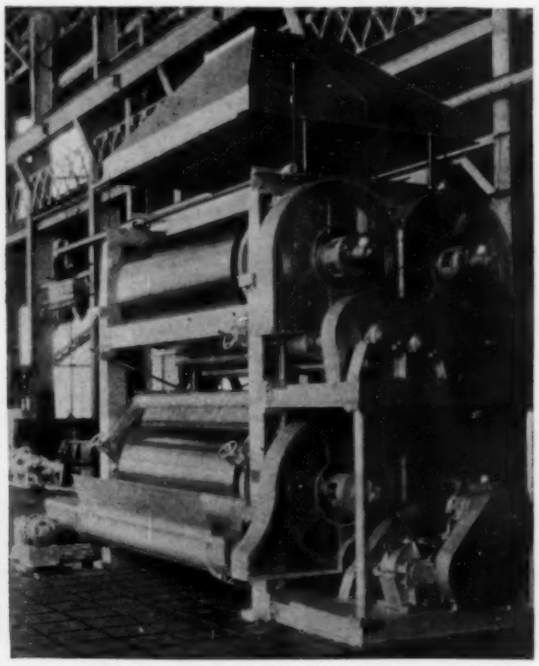








Above: New Barnstead water still
Center: Complete Pfaudler glass-lined distillation set-up
Right: Podbielniak centrifugal Super-fractionator



At Left: New one-pass Buffalo evaporator set up without accessories; at right, Buffalo combination double-twin drum dryer

DISTILLATION, EVAPORATION and DRYING

TWO manufacturers are planning to show improved water stills, including the Blaw-Knox Co., Pittsburgh, Pa., and the Barnstead Still & Sterilizer Co., Forest Hills, Boston, Mass. The latter concern states that its new still will be of 100 gal. per hour capacity. In addition to the regular preheating and venting features, the still will be equipped with a new demountable condenser for ready cleaning. This condenser is to be standard on all stills of 50 gal. per hour capacity and larger.

Reporting development of still denser and more resilient glass linings, the Pfaudler Co., Rochester, N. Y., is planning to show one of its newest complete distillation assemblies. Where formerly it was the practice to hook up a glass-lined still with a copper condenser and other equipment of different material, the company states that many manufacturers of easily contaminated products are now specifying glass-lined equipment throughout, including still, intermediary piping, condenser, receiver and even valves. An accompanying view shows such an installation completed not long ago at the pharmaceutical plant of John Wyeth & Bro., Philadelphia.

At this year's show will be the first public operating demonstration of the centrifugal, countercurrent Super-Contactor developed by the Podbielniak Industrial Research & Engineering Laboratories, Chicago. This device was announced at the 1935 Spring meeting of the American Chemical Society and the startling claims made for it aroused much interest at that time. The new apparatus evolved by Dr. Podbielniak will be applied to highly precise fractional distillation, but its principle has been stated to be equally applicable to equipment for gas absorption and scrubbing, for solvent extraction, for evaporation of water in a stream of air or for carrying out certain chemical reactions. It is said to be useful for any extended countercurrent contact between a liquid and a gas phase, or between two or more immiscible liquid phases.

The new device employs centrifugal force, instead of the gravitational force used to separate the phases in practically all previous countercurrent contacting equipment. Hence the fluid passage can be compactly coiled into a spiral, or otherwise arranged so that great lengths of passage can be secured within very small overall dimensions. Through the use of centrifugal force extremely high vapor and liquid velocities can be employed, increasing the capacity out of all proportion to the size of the equipment. Nevertheless, the pressure loss in the apparatus can be made as small as desired, or even can be made negative. The

intimacy of contacting is said to be so great that apparatus equivalent to columns of many hundreds of plates can easily be constructed. For example, the fractionator shown in the accompanying view, similar to the one to be displayed, is stated to be equivalent in performance to a packed or bubble tray tower of 60 ft. height, although it is but 5 ft. high overall.

Extremely versatile distillation equipment in the form of an experimental distillation unit for use in chemical engineering laboratories is to be shown by the Vulcan Copper & Supply Co., Cincinnati, Ohio. The unit may be used for either batch or continuous operation, for fractionating, exhausting or rectifying.

A new one-pass evaporator developed by the Buffalo Foundry & Machine Co., Buffalo, N. Y., will likewise be on display. This unit was developed for the concentration of heat-sensitive materials, operating at extremely high velocities. It has been estimated that material remains in the evaporator less than 40 seconds. The machine is said to overcome a difficulty that has been common with one-pass evaporators, namely, concentrating with a varying quantity of solids in the dilute liquor.

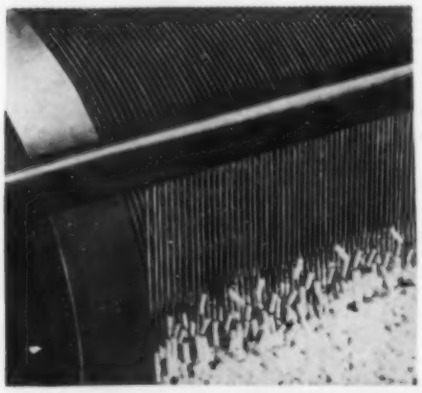
Buffalo Foundry will show a new type of drum dryer which combines this company's double and twin drum types. As appears from the illustration on page 629, the dryer comprises four drums. On the upper pair the material is partially dried, then delivered in semi-liquid condition to the lower pair of drums which complete the drying operation. The upper pair are similar to the twin type, having the drums rotating toward each other and upward. The lower pair are similar to the double type, with the drums rotating toward each other and downward. It has been found that many liquids which heretofore could not be handled on drum dryers can be dried successfully on this type of combination machine.

Drying Material in Stick Form

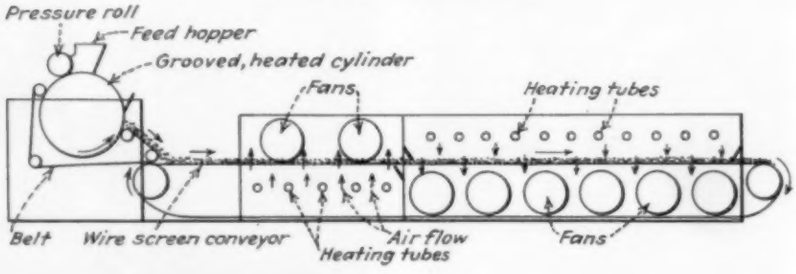
Aero-Form drying, a novel principle that has recently been developed by Proctor & Schwartz, Philadelphia, will be shown by this company. It is a continuous method of drying wet solid and plastic materials whereby high drying and handling speed, together with positive uniformity of results, elimination of dusting and contamination are said to be attained. The method is described as suitable for many products which were formerly dried only on trays and trucks. An accompanying drawing shows the dryer in section. At the left end is a device for pressing the wet solids into short sticks. This consists of a grooved drum, steam heated so as to accomplish partial drying. The sticks of material are continuously formed and removed from the drum, as shown in the view at the left. They then traverse the dryer, loosely piled, on a mesh belt where heated air is driven through the bed. Where the dryer has been used, remarkable increases in drying speed have been accomplished, for example, in the case of lithopone which in a truck dryer required just 36 times as long.

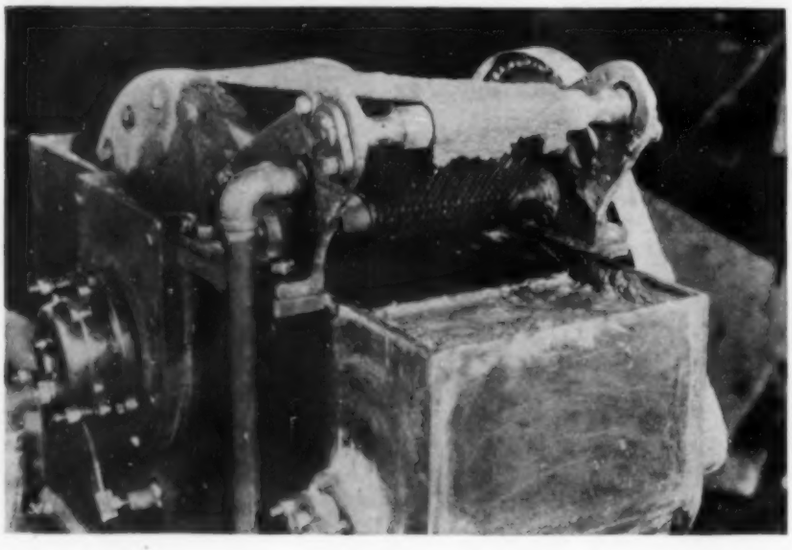
FILTERING, CENTRIFUGING AND SIFTING

MANY improvements in filtration and related operations will be evident at the Exposition. Alsop Engineering Co., New York, has improved its Hy-Speed asbestos disk filter in a number of details. The new model is equipped with ball-bearing, rubber-tired wheels for ready portability. A fully



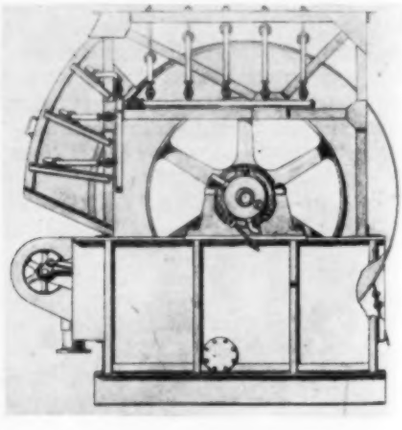
Proctor & Schwartz Aero-Form dryer, showing, at left, the drum forming sticks of moist material and, below, a simplified sketch of the entire dryer in cross-section

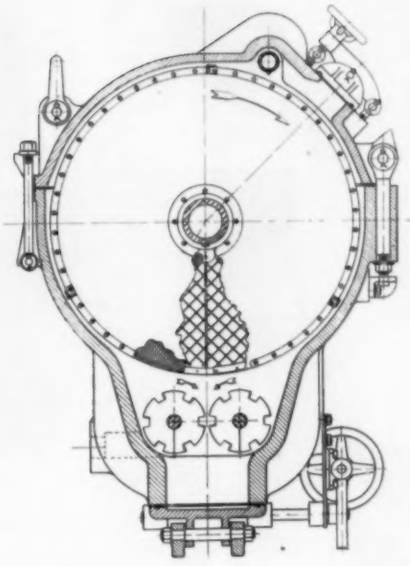




Left: New Goslin-Wright cord filter, a mechanism requiring no filter cloth

Below: Goslin-Wright vacuum filter of improved construction





Above: Individual vacuum valve of new Oliver-Young filter

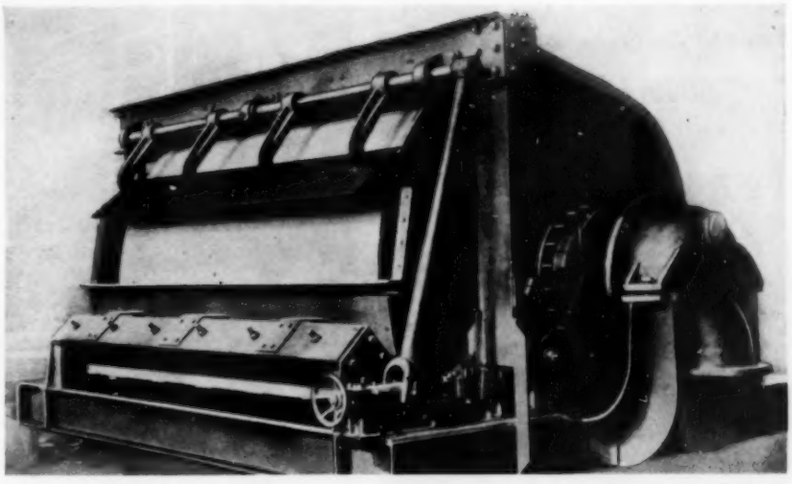
Top Center: Oliver pre-coat filter in operation

Top Right: Swenson dry-discharge pressure leaf filter

Right Center: Swenson pre-coat filter

enclosed, explosion-proof motor with built-in reduction gear operates the pump at slow speed. A double valve control permits the pump to be used either for filtration or for other pumping work. An automatic pressure relief to protect the motor against overload is provided.

All stainless steel construction is employed in a small, continuous vacuum filter, designed especially for technical schools and capable of use either with string or scraper discharge, to be shown by Filtration Engineers, Inc., Newark, N. J. The equipment includes an especially large reservoir so that it can be run for a considerable time without requiring a pump.



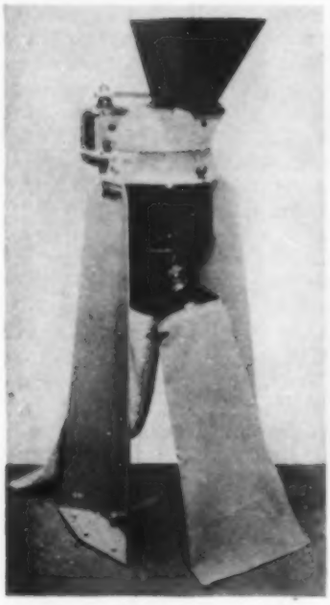
Filter Without Cloth

Several new developments will be demonstrated by Goslin-Birmingham Mfg. Co., Birmingham, Ala., but the most striking of these, undoubtedly, is the new Goslin-Wright cord filter which operates without cloth, without a drainage member, without discharge mechanism. The filter medium consists of a grooved drum in the grooves of which endless cords operate. The interstices between grooves and cords act as openings for the passage of filtrate, but the cords retain the solids. The cords are conveyed from the drum over a discharge roll and the cleaned cords returned to the drum over a grooved aligning roll. Corrosion-resistant construction can be employed. With the cords washed extraneous to the filter, there is no danger of contamination of filtrate with the wash water.

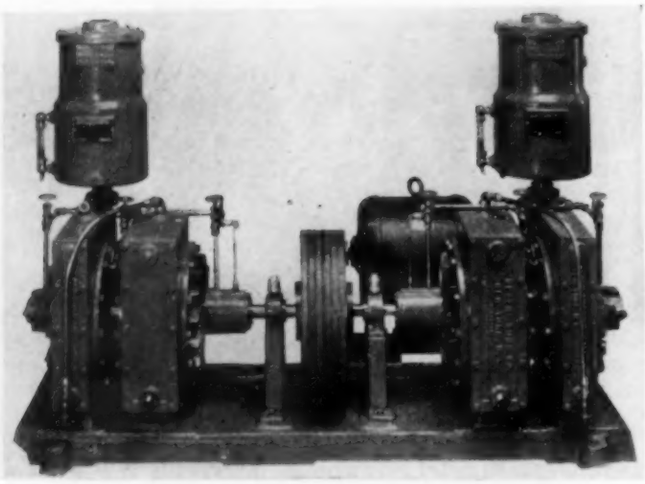
This concern has developed a continuous vacuum filter of conventional design, but provided with a new drainage assembly and new discharge valve. It will also show an improved Vallez filter leaf, designed for more uniform cloth tension and greater net filter area. Still another new product is called the Multi-Press, a device for the continuous expression of liquids from fibrous products, such as water from paper pulp. The press is designed to permit controlled feed to the compression rolls under high pressure, while maintaining free discharge of the expressed liquid and delivery of the dewatered product.

A filter said to be particularly well suited to the thickening and washing of paper pulps and similar products is the Oliver-Young, to be shown by Oliver United Filters, Inc., New York. This filter features a new valve and drainage system, with each filter section draining directly into the hollow drum through an individual valve of large area operated by a counterweighted shoe swinging on a hinge. As the drum rotates the shoe (see illustration) gradually closes off the opening, cutting off the vacuum. As rota-

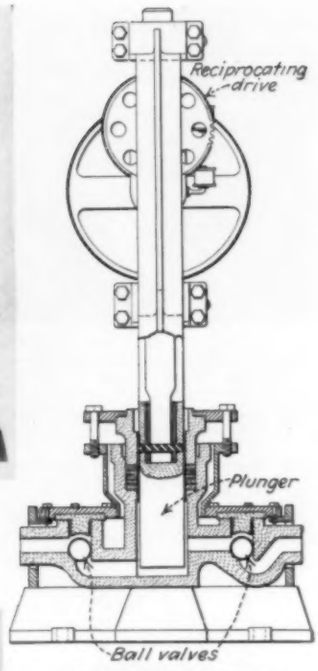
Fletcher centrifugal speed control



Above: Improved Blutergess turbine sifter



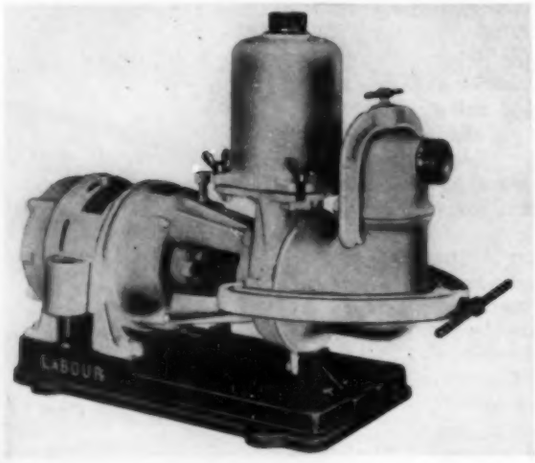
Above: Beach-Russ rotary compound vacuum pump



United States Stoneware plunger pump

Below: New Haveg acid-resisting fan

Below: LaBour type SM pump for easy cleaning



tion continues the valve begins to open, opening fully at the low point of rotation. This concern will also show an improved Sweetland filter element designed for faster drainage and easier cloth attachment.

Two exhibitors are planning to show a recent filtration development, the precoat vacuum drum filter. Filters of this type are used for clarifying liquids containing fine particles in suspension, colloidal matter or small percentages of solids. The filter is first pre-coated with about 1 in. of filter aid, drawing this from the filter tank. The tank is then emptied and the solution to be clarified turned in, depositing its solids as a thin layer on the filter aid. The knife is operated automatically, moving gradually toward the drum so as to remove the solids together with a thin layer of filter aid, continually presenting a fresh filtering surface. Such a filter will be shown by Oliver United and also by the Swenson Evaporator Co., Harvey, Ill.

Swenson will also display an improved rotating pressure-leaf filter, designed to discharge filter cake dry, rather than by sluicing. The cake is released from the leaves by a slight back blow and air jets. The bottom channel is wide and provided with twin screw conveyors and a quick opening door to permit rapid removal of the filter cake.

In the realm of filter mediums, Filter Media Corp., New York, has brought out a new material for vacuum and pressure filtration. It is a molded material, not a fabric, yet is flexible and capable of application to the filter in a manner similar to cloth. It is said to be highly resistant to acids even at 150 deg. Newark Wire Cloth Co., Newark, N. J., will exhibit a new metallic filter cloth for use in breweries, stating that such application is relatively recent.

Several improvements in centrifugal separating equipment will be on display. American Tool & Machine Co., Hyde Park, Mass., has developed several special types, including one with a dumping basket, one with a fully enclosed outer case for dry ice, one with the supply tank built in as part of the machine, another with a special hot blast for small batches. Fletcher Works, Philadelphia, has developed what is called the new Centroid speed control to secure the flexibility of two or more speeds with a single-speed motor. It consists simply of one or more centrifugal Mercoid switches which revolve at the same speed as the basket. At the desired speed the mercury is thrown outward, breaking the circuit. As the speed falls, the circuit is again completed. The regulated speed can be readily adjusted by altering the angle of the Mercoid (see illustration, p. 631). This company will also show a new small 17-in. centrifugal of extreme simplicity. The basket is mounted on the motor shaft and there are only two bearings. It is said to be self-balancing to an unusual degree.

The Blutergess turbine sifter, introduced several years ago by the Abbé Engineering Co., New York, will be shown in an improved model, equipped with a V-belt drive, new feeding device and dustproof housing. The capacity is said to have been increased sufficiently for most commercial sifting.

FLUID HANDLING AND HEAT TRANSFER

MANY makers of fluid handling equipment will be represented at the Show. Beach-Russ Co., New York, has a new rotary, integral, compound vacuum pump, capable of producing a vacuum within 1 micron of absolute. It occupies little more floor space than a single stage pump, but produces a higher vacuum. A new wet vacuum pump, known as the Gyro-type, will also be shown by this company. It will exhaust to 29.5 in. Hg, handling wet vacuum of any percentage.

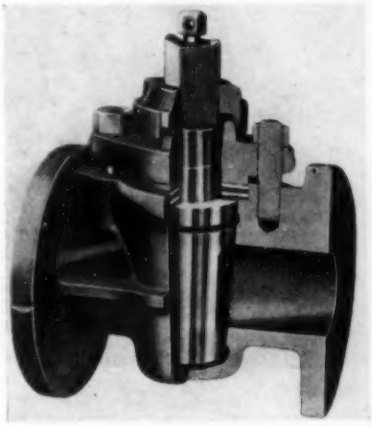
Duriron Co., Dayton, Ohio, plans to display valves, pumps and a heat exchanger, all of corrosion-resisting construction. A new design of Duriron Y valve is heavier and stronger than formerly and permits straighter flow. A new Durco alloy steel Y valve will be shown with rising stem, outside screw and self-centering disk. The 2B pump, newest of this company's line of centrifugal pumps, is of the non-clogging, closed type, 1½-in. suction, 1-in. discharge, and made in Duriron and a variety of other alloys. A line of Durco alloy steel centrifugal pumps in sizes from 1 to 8 in. suction will be displayed. A new heat exchanger, made in Duriron and a variety of corrosion-resisting steels, will be shown, consisting of a central steam tube within a larger tube, with a special baffle arrangement between the tubes. The whole is enclosed in a steam jacket.

Seamless steel tubing of tantalum will be shown by the Fansteel Metallurgical Corp., North Chicago, Ill. The tubing is available in a complete range of sizes from hypodermic tubing to 1 in. and larger. Various wall thicknesses are offered. Tubing and drawn parts are supplied in various styles, such as with flared ends, round or flat bottoms.

Several developments in fluid handling have been made by General Ceramics Co., New York. One is a new small stoneware centrifugal pump for heads of 20 to 25 ft. Another centrifugal pump has all parts in contact with the liquid of glazed porcelain. A duplex stoneware condensing coil will be shown, having two connected parallel tubes, each 1½ in. inside diameter and 56 ft. long.

Haveg Corp., Newark, Del., will introduce a standard line of Haveg fans at the Show, in four sizes ranging from 500 to 10,000 c.f.m. at static pressures to 3 in. w.g. They are said to be suitable for continuous operation on acid gases at temperatures to 265 deg. F. This company has developed a new type of Haveg piping of simplified design, employing A.S.M.E. bolt circles and standard center-to-face dimensions, with minor exceptions.

Hills-McCanna Co., Chicago, has modified the Hills-McCanna Saunders valve, shown at the last Chemical Show, for corrosive service, so that it is adaptable to air and water service as well. This company will also show the new type M proportioning pump, a design for accurately feeding liquids and for pumping against high pressures. A



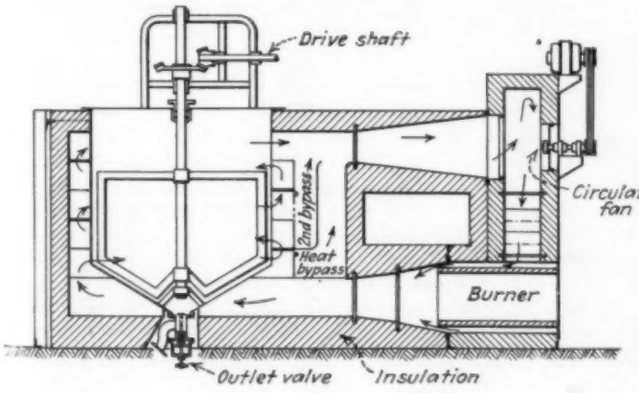
Above: Emco-Nordstrom valve

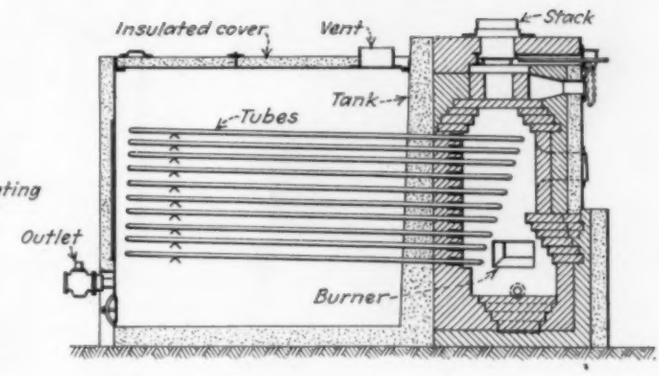
Top Center: Flexlock rubber joint

Center: Duriron heat exchanger

Right: Duriron Y valve

Below: At left, Baker-Perkins Diathermatic cooker, and at right, this company's Perkins tube heater





screw adjustment for changing the delivery rate with the pump in operation is provided.

Two new pumps, types Q and SM, will be displayed by the LaBour Co., Elkhart, Ill. The first is a non-self-priming pump with the same type of impeller used in this concern's earlier pumps, but with a casing permitting initial efficiencies comparable with closed-impeller pumps. Its wide clearances are said to give it lasting high efficiency. The second pump (illustrated) is a self-priming type for easily contaminated liquids, designed for ready cleaning and inspection. It is generally made of stainless steel.

Merco-Nordstrom Valve Co., Pittsburgh, Pa., will exhibit a new plug lubricated valve known as the Emco-Nordstrom, made in standard gate valve face-to-face dimensions for use in replacement without rearrangement of piping.

Schutte & Koerting Co., Philadelphia, plans to exhibit a four-stage steam jet vacuum pump capable of producing a dead-end vacuum of $\frac{1}{4}$ mm. absolute. This probably is the first four-stage jet vacuum pump that has ever been built, according to the manufacturer.

Both pumps of various types and exhausters are to be shown by the United States Stoneware Co., New York. A $\frac{3}{4}$-in. chemical-stoneware-lined centrifugal pump of simplified design is one of the new types. Another is a rubber-lined pump and still another of stainless steel. A rubber-lined exhauster will be shown, and a new 1-in. chemical-stoneware-lined plunger pump (see illustration). The company will exhibit a new line of heavy-duty chemical-stoneware-lined exhausters, and a development in pipe line construction, the recently introduced Flexlock rubber joint. This is a rubber sleeve of special shape for readily making up joints in bell-and-spigot stoneware pipes used for practically any fluid.

F. J. Stokes Machine Co., Philadelphia, Pa., will show a 50-cu.ft. high vacuum pump of improved design, equipped with a centrifugal oil clarifier.

Interesting new developments in heat transfer equipment will be features of the display of Baker-Perkins Co., Saginaw, Mich. Two types are available: one known as the Diathermatic cooker will be shown in connection with a varnish kettle. It is oil-fired and heats by recirculated combustion gases under subatmospheric pressure. An accompanying drawing shows the principle of this type, as does another drawing the principle of the "Perkins" tube type of heater. The latter employs sealed, fluid-filled tubes for high-temperature heating, the tubes extending from the furnace into the vessel to be heated. As each tube is a sealed system, no traps are required. The method is said to make possible better control than can be had with direct firing.

Use of a longitudinal shell baffle, which divides the shell into two compartments, will be featured by J. P. Devine Mfg. Co., Mount Vernon, Ill., in an improved design of heat exchanger. The baffle is provided with packing along the edges and a screw mechanism for compressing the packing against the inside of the shell.

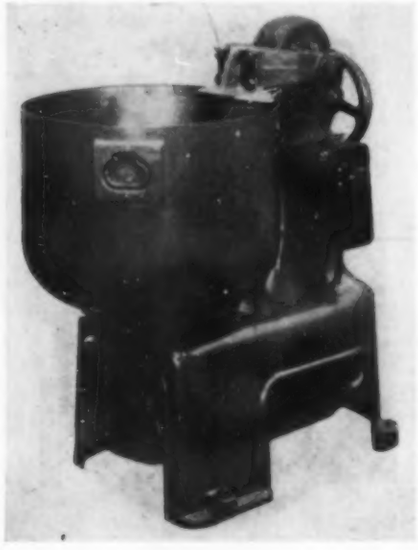
MIXERS AND SEPARATORS

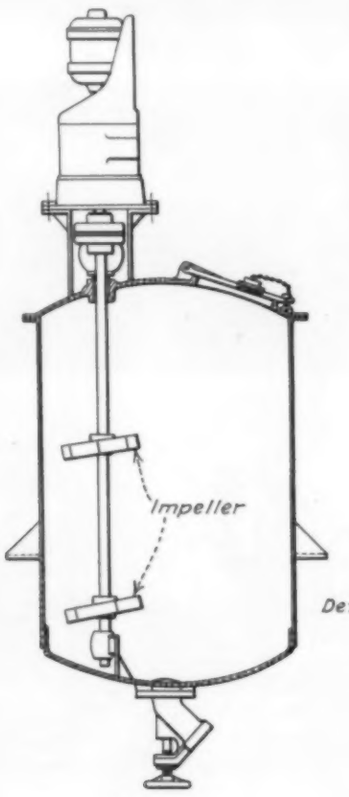
AMONG the new and improved pieces of mixing equipment to be shown, Abbé Engineering Co., New York, will demonstrate an improved form of the Abbé-Lenart mixer. This is a stainless steel jacketed design for tooth paste, differing in many respects from earlier models. It has the standard rotor in the bottom, and is also equipped with agitator arms and a scraper ar-

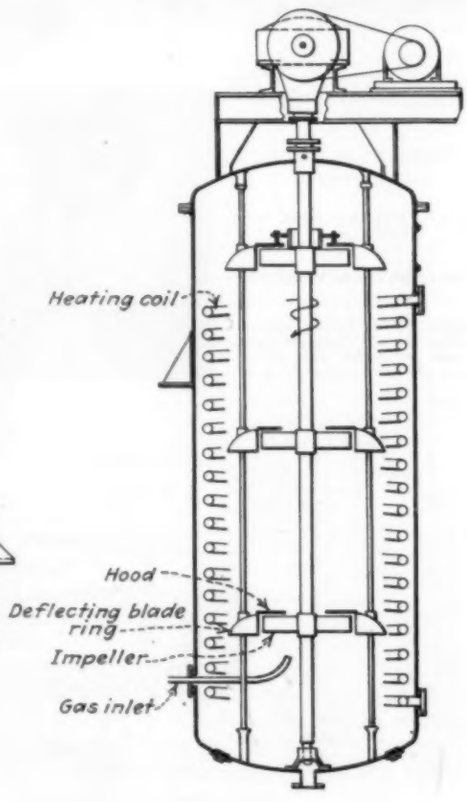
Right: Franz FerroFilter, a magnetic separator for slips

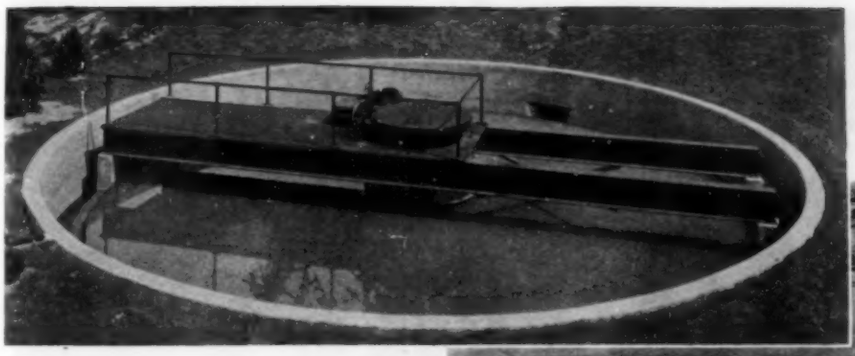
Bottom Left: New Baker-Perkins Centra mixer

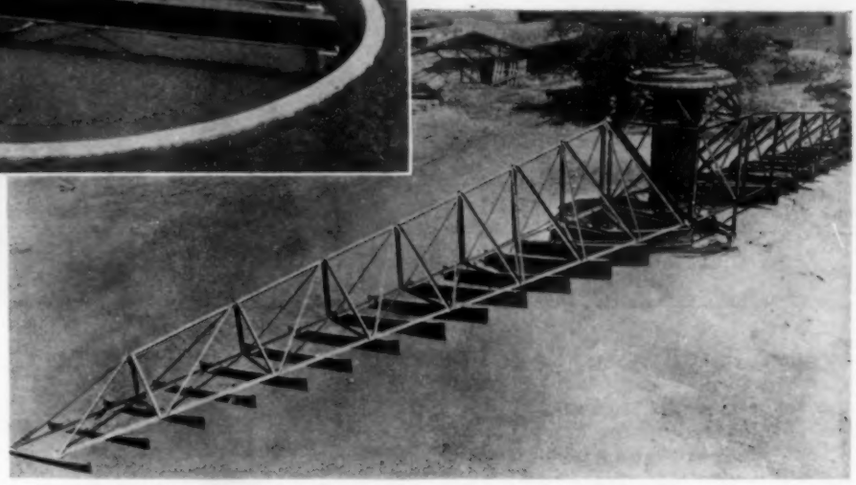
Below: At left, off-center Turbo mixer; at right, new Turbo gas absorber

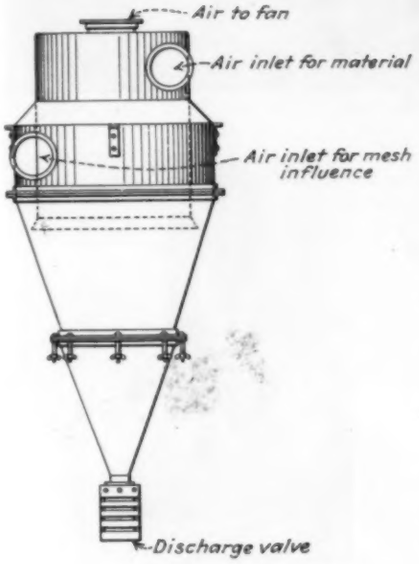












Top: Dorr type A thickener, showing minimized head-room

Above: Door Centrepier rake mechanism, showing new rake mounting

Left: Improved Federal centrifugal air classifier

rangement suspended from the cover and driven by an overhead motor drive. A vacuum pump attachment is provided for removing air during mixing.

C. O. Bartlett & Snow Co., Baltimore, Md., plans to show an improved form of Lancaster mixer. Baker-Perkins Co., Saginaw, Mich., will show a redesigned vacuum mixer, a new type Werner & Pfleiderer mixer with stationary trough and quick-opening bottom discharge, and the new Centra mixer (see illustration, opposite page) which is a greatly simplified change can mixer, in which the only gearing is in the gear-head motor. The bowl revolves around an off-center stationary agitator which scrapes the bowl and tips back for bowl removal.

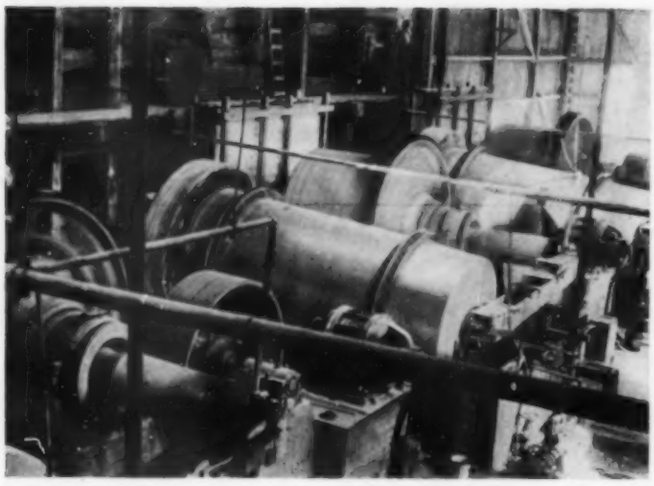
A trowel type mixer with sifter attachment, in all-welded construction, and featuring spray coating with various corrosion-resistant metals, will be shown by the Robinson Mfg. Co., Muncy, Pa. This machine has dust-tight roller bearings and special slotted ends for convenient removal of the agitator or mixing element. Two mixer types will be demonstrated by the Turbo-Mixer Corp., New York. The two, shown in the drawings at the left are types of recent development. The off-center mixer (left) uses no stationary deflecting blade ring. The off-center position is said to prevent undesirable swirl. This type is employed in tanks of all sizes for many purposes. The type shown in the right-hand drawing, known as the Turbo gas absorber, is used for oxidation or aeration, or for reactions between gases and liquids, such as the hydrogenation of edible oils. The mechanism is a shaft bearing one or more impellers, each with a stationary deflecting blade ring which is covered by a stationary hood. Liquid is drawn into the impellers both at top and bottom, and at the same time gas is introduced under the impeller through a pipe. If the mechanism is located on the surface of the liquid, gas is also drawn into the impeller from space above the liquid. Extremely high absorption is said to result.

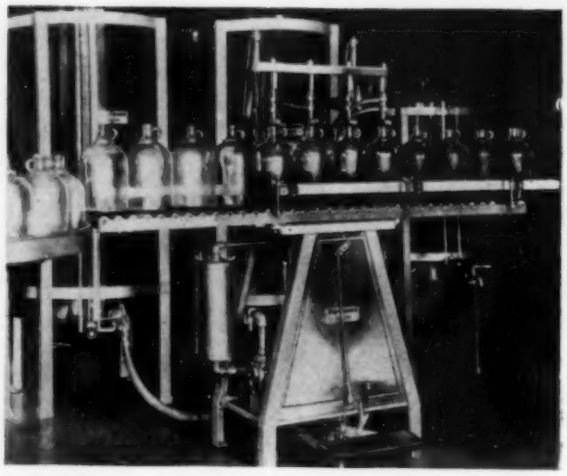
Chemical - stoneware, motor - driven mixing units, utilizing flat or spherical-bottom vessels, with mechanical agitators, in sizes from 25 to 200 gal., will be shown by the United States Stoneware Co., New York.

Among the equipment classed as separators, three showings may be mentioned. A new construction, eliminating the hopper section previously used, has been employed by Federal Pneumatic Systems, Inc., Chicago, in the air classifier shown in the accompanying illustration. Classification is effected by opposing one centrifugal current of air to another. It is stated that the device provides means for making sharp mesh cleavage between fines and oversize, down to 5 microns. Another air separation device, not entirely new, but new to the chemical industry, is the Sutton, Steele & Steele air table, to be shown by Separations Engineering Co., New York. This device, used in metallurgy for dry concentration by means of differences in density, shape or size, is said to be highly selective, handling materials which cannot be treated satisfactorily on wet tables. This same exhibitor will show the new Franz FerroFilter, a magnetic separator for liquids and slips, which is said to be capable of removing particles so minute as to escape in every other form of magnetic treatment. The material passes through a number of gratings, electromagnetically magnetized, which present in compact form an extremely long edge where magnetic attraction is concentrated.

THICKENERS AND CLASSIFIERS

MANY changes in appearance and design will be noted in the equipment to be shown by the Dorr Co., New York. The general trend has been toward greater rigidity and refinement of design, and toward minimization of headroom. One such development is the Centrepier thickener, with self-lifting and lowering rake arms. The rake feature permits the rake to operate at an inclination dependent upon the severity of the load imposed. This construction is the type to be used in the large installation recently announced for the All-American Canal and the mechanism shown in the view above is one for that installation. All mechanism in the new construction is supported solely by a stationary center pier, eliminating the cumbersome superstructure. The rake arms, it will be noted, are hinged to a

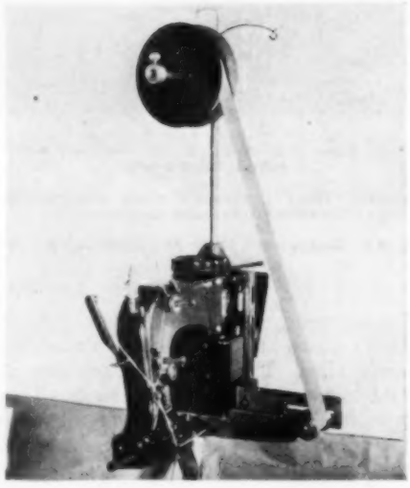


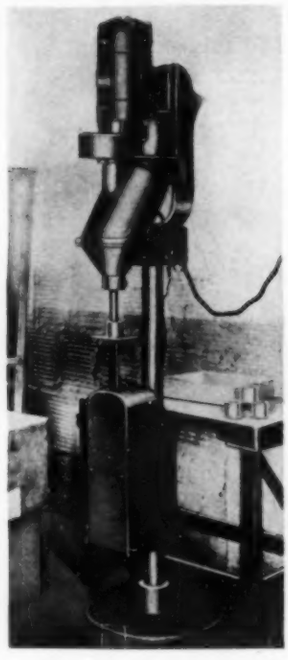


central revolving cage, so as to be thrown backward and upward under overload.

Similar refinement and elimination of the old bridge type superstructure will be noted in the company's type A thickeners and agitators (see illustration). The new drive operates by means of a gear which is A shape in cross-section, the rim of which is supported on antifriction bearings. Reduced headroom is again a factor in the new Dorr turret-bowl classifier, which differs materially in appearance from earlier bowl classifiers made by this company. Higher efficiency, greater strength and capacity, and improved bowl drive are claimed for the new unit.

Although a model of the countercurrent classifier made by the Hardinge Co., York, Pa., has been exhibited before, this Show marks the first public exhibition of an actual working-size unit. This classifier employs an inclined rotary drum, on the inner surface of which is a spiral flight to move the sands upward toward the discharge, counter to the water flowing toward the lower end. Washing action results as the sands are rolled over.





Top Left: Hardinge countercurrent classifiers in a metallurgical plant
Top Right: Alsop semi-automatic filler
Above: Bemis closing machine for bags
Right: Ferguson Packomatic auger packer

BOTTLING, PACKAGING AND CONTAINERS

TWO new pieces of equipment in this field will be shown by the Alsop Engineering Co., New York. One is a semi-automatic vacuum bottle filler made in sizes of from four to twelve or more spouts, necessitating only a few simple adjustments for quick change-over to different size containers. Containers move along the stainless steel bottle guide by hand, stopping automatically in the correct position under the filling spouts. The filling head and spouts are lowered under pressure of a foot pedal. Every bottle fills evenly to the proper height; cracked or imperfect bottles are automatically rejected. Another development is this company's new Hy-Speed Labelit which applies a smooth, even coating of glue to labels of all sizes and styles. An over-size label feed table with instantly adjustable guide enables the operator to feed the labels into the machine with a minimum of time and effort.

Bemis Bro. Bag Co., St. Louis, Mo., will show a new device for closing the tops of open-mouth, multiwall bags, heavy-duty paper or waterproof bags. This consists of a Union Special sewing machine which sews a 2½ in. strip of tape across the top of the bag with filler cord inserted in the stitching. An attachment clips off the tape after sewing.

For packing non-free-flowing powdered products, as well as pastes and putty into bottles or cans, the J. L. Ferguson Co., Joliet, Ill., has developed a new Packomatic auger packer which fills from the bottom of the container up to the top. For the packing of barrels, the Jeffrey Mfg. Co., Columbus, Ohio, will show a new Jeffrey-Traylor packer, operated by a vibrator which connects to any standard a.-c. circuit and oscillates a flat plate on which the barrel rests. The packer is available in seven sizes from 50 to 800 lb., and is said to impart no vibration to the building. A variety of packaging equipment, featuring recently improved devices, will be shown by the Pneumatic Scale Corp., Quincy, Mass. The equipment will include a bottling installation, complete from cleaner and filler through to labeler.

Another auger packer will be shown by the Triangle Package Machinery Co., Chicago, Ill. Among advantages claimed for the new model U device are the quick and easy means for removing the feed bowl for cleaning; and a new auto-

matic brake which positively locks the auger when the exact amount has been filled into the package. This company plans to exhibit its model SPA automatic measuring machine for accurately measuring the volume of small quantities of both free- and non-free-flowing materials.

In the container field, the Carpenter Container Co. will exhibit a line of rubber-lined fiber drums for the shipment of acids, alkalis and other liquids. It is pointed out that this new development makes possible the use of fiber drums as single-trip containers for products not previously permitted in such drums. Another drum, the General one-piece rubber drum, will be shown by Maurice A. Knight, Akron, Ohio. The new drum contains no metal or other material subject to corrosion, its structural strength being obtained from the type of rubber compound used. Such drums are said to be exceptionally strong. Furthermore, the drums are light, only 35 lb. in the 15-gal. size.

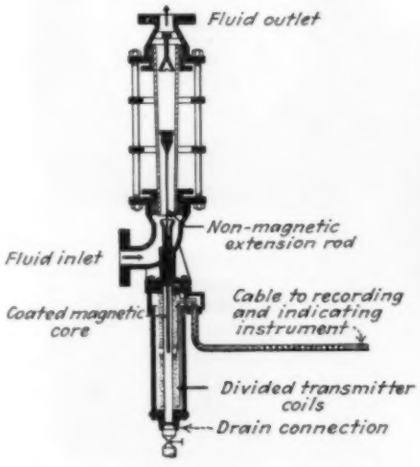
INSTRUMENTS, WEIGHERS AND FEEDERS

AS AT all Chemical Expositions in recent years, a great many new indicating, recording and controlling instruments will be shown. The American Meter Co., New York, has improved its Metric integrating orifice meter so as to compensate automatically for variations in the static pressure of the gas being measured. The integrator extracts the square root of the differential each minute and multiplies this square root by the square root of the absolute pressure. The sum of the products is continuously totalized on a counter-index.

A force of 1,000 lb. for controlling dampers or fan motors for draft regulation can be exerted by new air-operated draft regulator, to be shown by Bailey Meter Co., Cleveland, Ohio. Pressure within the space under control is applied to a diaphragm on the regulator, this pressure being counterbalanced by a weight which varies with the position of the regulator. Motion of the diaphragm operates an air-pilot valve to control the regulator. The company will also show a new air-operated indicator-controller for temperature and pressure. This is provided with a widely variable sensitivity adjustment.

Bristol Co., Waterbury, Conn., will show several new instruments, including a new potentiometer with wide strip chart; a new explosion-proof mercury-switch thermometer-controller of the direct-set type; and an automatic-reset cycle controller. Recently developed flowmeters will be shown, together with a new resistance thermometer for measuring temperatures between minus 40 and 300 deg. F., employing a pure nickel resistance bulb. The hook-up diagram shown below, consisting of a wheatstone bridge circuit, with two X_t resistances respectively equal to the bulb resistance at maximum and minimum temperatures, for standardization of the instrument, two equal resistances in the second pair of arms of the circuit, and a three-copper-wire lead system. An improved Free Vane air-operated controller, and a low-range differential draft gage, recording to 0.01 in. w.g., will be shown.

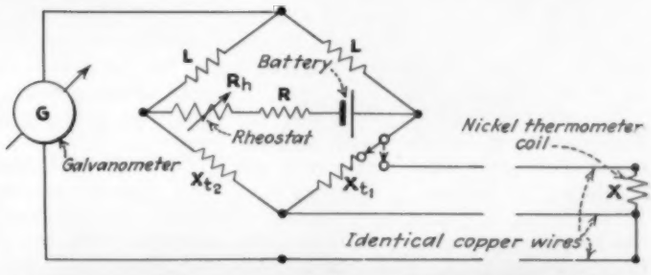
Electric Rotameter in section



Micromax on-and-off controller

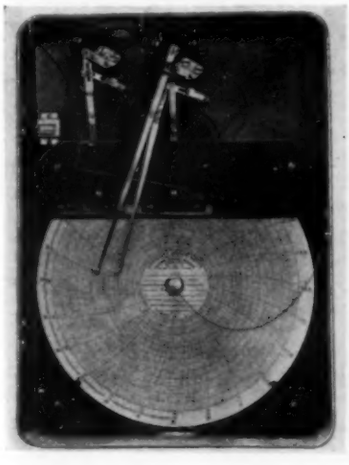
Below: Hook-up of new Bristol resistance thermometer

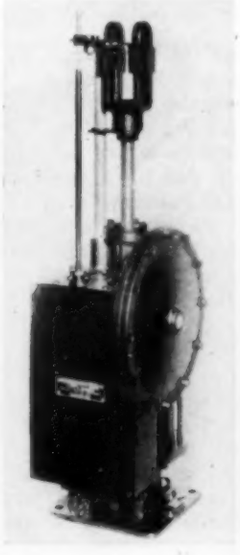
Bottom: Hardinge constant-weight feeder with variable-speed drive

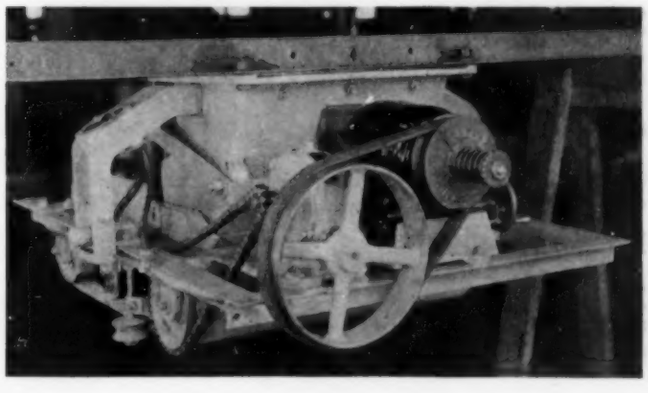


Right: Bailey draft controller

Below: Metric integrating orifice meter







Left: Richardson Conveyometer

Top Right: Syntron vibrating dry feeder

Below: Exact-Weight scale head

Center: Reeves Hydraumatic control

Right Center: New Tag controller case

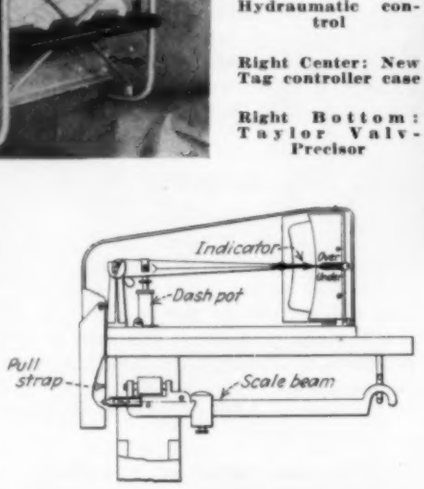
Right Bottom: Taylor Valv-Precisor

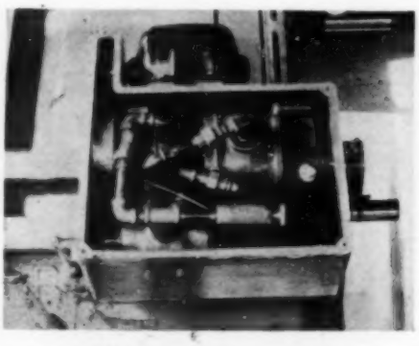
Brown Instrument Co., exhibiting with the Minneapolis-Honeywell Regulator Co., will show a number of new instruments, including the new line of Brown air-operated controllers in types ranging from simple on-off to throttling and anticipating varieties. Illinois Testing Laboratories, Chicago, Ill., will show a new direct-reading air velocity meter known as the Velometer, in which air velocity is measured by a vane against which the moving air presses. Another new development is called the horizontal edgewise pyrometer, which is a multi-point indicating instrument for use with a thermocouple.

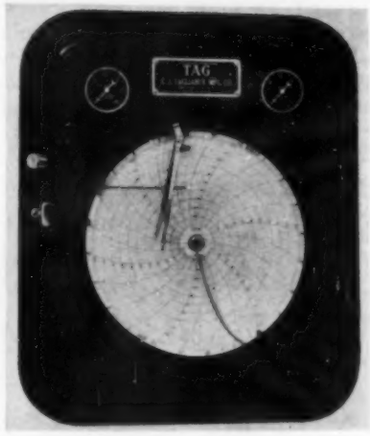
New developments in the measurement of speed, pH and temperature will be shown by Leeds & Northrup Co., Philadelphia, Pa. A small magneto attached to the moving part, operating a potentiometer, is used for speed recording. A potentiometer electrometer will be shown for measuring pH and oxidation-reduction potentials. Automatic control of pH will be demonstrated, employing a Micromax recording controller in conjunction with an antimony electrode and motor-driven control valve. Simplified two-position control has recently been developed, using the Micromax mechanism to operate a mercury switch for on-and-off control.

An improved electric Rotameter for flow recording, together with a Rotameter of the new tubular case type will be shown by Schutte & Koerting Co., Philadelphia, Pa. The rotor element of the former instrument (see illustration on preceding page) positions a magnetic armature core within a divided transmitter coil which is part of an inductance bridge circuit of the Cochrane type. This position is duplicated by a similar core within the recording and/or indicating instrument.

C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., plans to show an improved case design on many of its newer temperature, pressure and flow recorders and controllers. A new instrument exhibited will be this company's No. 40 controller, a simplified, refined version of earlier designs of non-indicating, air-operated controllers. For extreme precision







of control Taylor Instrument Cos., Rochester, N. Y., will show the new Valv-Precisor (illustrated at right), an auxiliary control device to be mounted on the diaphragm valve to insure exact positioning of the valve disk in accordance with the dictates of the controller.

Several developments in weighing and feeding equipment will be in evidence. In addition to scales for small package work, the Exact Weight Scale Co., Columbus, Ohio, will show new indicating heads for beam scales. These devices (see illustration above) are available for all types of portable and dormant platform scales and are said greatly to improve the speed, efficiency and accuracy of operation.

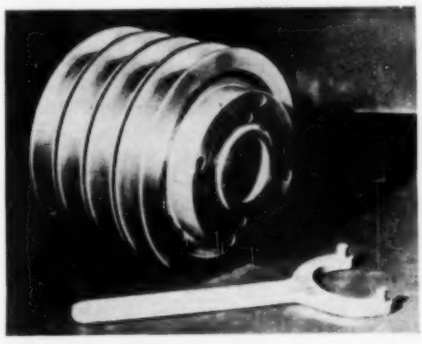
Continuous weighing feeders of several types will be shown. The Hardinge Co., York, Pa., has equipped its constant-weight feeder with a variable-speed belt drive, as shown on the preceding page, so that it is not necessary to change the counterweights to change the rate of feed. The operator is thus able to make a direct reading from the revolution counter of the tonnage fed per unit over any desired period of time. Jeffrey Mfg. Co., Columbus, Ohio, will show a Jeffrey-Traylor constant-weight feeder in which a vibrator is used to feed the weighing belt. Any variations in weight are constantly and automatically corrected on the batching feeder. This company's new electric vibrating batching feeder will be demonstrated, electrically controlled by a photoelectric cell, mounted on the dial of a scale. Richardson Scale

Co., Clifton, N. J., will show its new Conveyometer, an automatically self-checking feeder. This device includes a feed conveyor, fed from a hopper, and a check-weighing conveyor. Accuracy of results is indicated by signal lights.

Syntron Co., Pittsburgh, Pa., has adapted electric vibrators to several sorts of feeding and weighing equipment. The company will show noiseless electric vibrators for use on hoppers, bins and chutes; a pulsating feeder conveyor; a dry feeder with remote electrical control (see illustration on page 638); and a continuous weighing machine combining a vibrating feeder and a weighing belt supported on a scale. Several new weighing developments of the Toledo Scale Co., Toledo, Ohio, will likewise be shown. One of the units will automatically weigh out granular material, after which it will weigh liquid material, permitting the two to be combined. The improved Toledo Printweigh will be shown, together with remote indicating of weights.

Triangle Package Machinery Co., Chicago, Ill., expects to exhibit a weigher for feeding materials into packages, employing a vibrator type feeder.

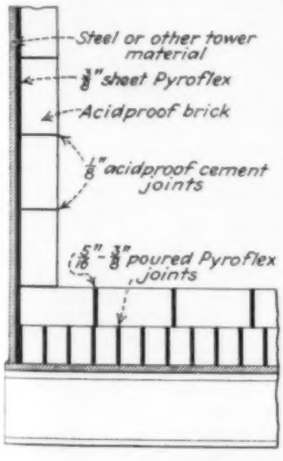
A device intermediate between control and power transmission is the Hydraumatic (hydraulic automatic) control for its variable speed transmissions, to be shown by the Reeves Pulley Co., Columbus, Ind. This device (see illustration on page 638) was developed to make possible automatic speed control from a very small indicating movement and to eliminate hunting in shifting from one speed to another.



CONSTRUCTION MATERIALS AND MISCELLANEOUS

SEVERAL new materials developments, including water-soluble resins, resin-rubber combinations and resins for air-drying paints and varnishes will be shown by the Bakelite Corp., Bound Brook, N. J. New construction materials to be shown by Custodis Construction Co., New York, will include examples of the Zeta bond, a unique masonry bond (see illustration) for acid-proof circular units. The peculiar shape of tongue-and-groove brick employed is said to result in the distribution of strains, hoop stress being carried by the brick themselves, with the mortar joints in compression. Tie rods are unnecessary. This company will also show Kabe acid-proof compounds, which are asphalt compositions supplied as powders to be melted and applied with a trowel; and Custodis-Kabe paints, for chemical resistance, manufactured on chlorinated-rubber, synthetic-resin and asphalt bases.

Construction of typical acid-proof tank lining, using Pyroflex


Steel or other tower material
3/8" sheet Pyroflex
Acidproof brick
1/8" acidproof cement joints
1/16" - 3/8" poured Pyroflex joints

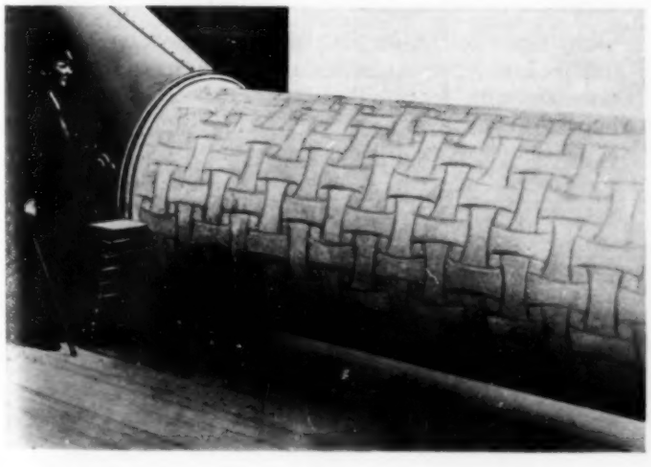
Above: Applying Quigley Q-Chromastic mortar to furnace

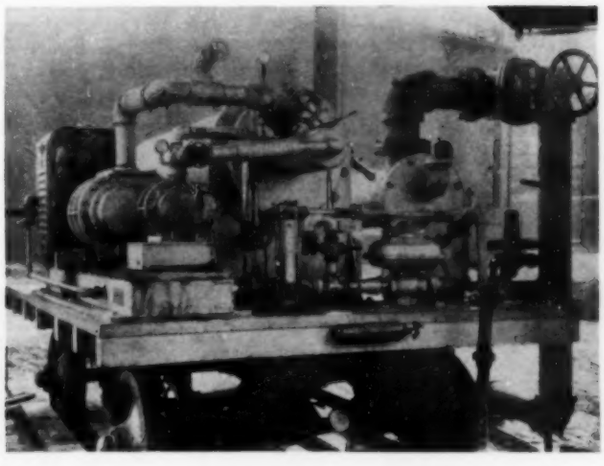
Lower Left: Acid gas flue of Zeta bond construction

Lower Right: Harrison inert gas producer in a gas plant

Left Above: Allis-Chalmers Vari-Pitch pulley

Below: Group of Berl Saddle packing units





Electro-Chemical Supply & Mfg. Co., Paoli, Pa., will have on display its new Triple X acid-proof cement and also the new Duro Sauer Eisen brick. The cement is one adapted for use especially with low concentrations of mineral acids or for intermittent contact with steam and water. It is a rapid hard-setting, high-silicate cement. The brick referred to is designed for construction of acid tank linings and is shaped so that a melt-and-pour compound can be poured between the brick.

Two chemical stoneware manufacturers plan to show a variety of new ceramic bodies. The General Ceramics Co., New York, will show Ceraware, a general-utility chemical stoneware; Ceramit, said to be the densest stoneware body manufactured; Cerawite, a white, practically iron-free ware; Ceratherm, a body of high thermal shock resistance; and Cerafrax, a body combining high thermal conductivity with high mechanical strength. U. S. Stoneware Co., Akron, Ohio, will exhibit various pieces of plant equipment made in Acitherm high-heat-conductivity stoneware. This company is now prepared to supply all sizes and shapes of process equipment in this material. The company will exhibit for the first time Ruplastoid, a depolymerized rubber compound for tank linings.

International Nickel Co., New York, has developed a number of new alloys, including S Monel (3¾ per cent silicon), an alloy of relatively high hardness for valve and pump parts. K Monel is an alloy capable of hardening by heat treatment. R Monel has been developed to bring out special machining qualities. Inconel-Clad steel, a product of the Lukens Steel Co., will be shown, a bimetal consisting of a layer of Inconel bonded to flange quality steel.

Pyroflex, a depolymerized colloidal resin material for tank linings, recently introduced by Maurice A. Knight, Akron, Ohio, will be shown in this company's booth. This material is resistant to most acids, to alkalis and does not alter with age. (See sketch, page 639.)

Several developments in the refractory field will be shown by the Quigley Co., New York. These include cellular insulating firebrick, high alumina super-refractory brick, and super-refractory brick made of electrically fused aluminum oxide. This concern will show a new acidproof brick for temperatures up to 2,400 deg. F., a new light-weight cellular insulating concrete; and a plastic, neutral, super-refractory surfacing mortar said to resist slagging action, flame erosion, corrosion and abrasion.

Several other developments difficult to classify will also be shown. Allis-Chalmers Mfg. Co., Milwaukee, Wis., will exhibit several new motors. These include a totally enclosed, fan-cooled, explosion-proof, squirrel-cage motor for use in explosive atmospheres; a line of compact, self-contained gear motors; a motor providing extreme protection of the windings against damage from dirt, grit, oil, moisture and mild acids; and a splash-proof motor. This company will show a specially reinforced V-belt sheave and its new Vari-Pitch sheave for V-belts, designed to permit simple adjustment of the pitch diameter so as to give variations in speed of 15-25 per cent per sheave. Link-Belt Co., Chicago, Ill., will show its newly motorized P.I.V. variable speed transmission, together with improved pillow blocks and a new motorized reducer.

Ansul Chemical Co., Marinette, Wis., will demonstrate a new cylinder hoist for handling sulphur dioxide and methyl chloride refrigerant cylinders. General Electric Vapor Lamp Co., Hoboken, N. J., will show a number of new and improved light sources for producing ultra-violet light and monochromatic light. Mine Safety Appliances Co., Pittsburgh, Pa., will show a new light-weight, half-hour breathing apparatus; its recently approved Comfo respirator; and an improved hose mask.

Monarch Manufacturing Works, Philadelphia, Pa., has developed a new spray nozzle for water, working on the direct pressure atomizing principle. Sizes range upward to 30 g.p.h. at 100-lb. operating pressure. Robinson Manufacturing Co., Muncy, Pa., will show an improved vertical screw elevator with motor drive mounted on the head. Roots-Connersville Blower Corp., Connersville, Ind., plans to demonstrate the Harrison inert gas producer for purging equipment containing explosive gases. These gas producers are said to generate inert gas containing less than 1 per cent oxygen and no CO.

F. J. Stokes Machine Co., Philadelphia, Pa., will have in operation a rotary tablet machine of improved design, together with an automatic tube filling and sealing machine featuring the new Westite method of hermetically sealing collapsible tubes.

Two exhibitors plan to show new style tower-packing materials. Maurice A. Knight, Akron, Ohio, will feature the new Berl Saddle packing. Now available in 1-in. and ½-in. sizes, it is planned to produce this packing in 2- and 1½-in. sizes. This packing gives extremely large surface per unit of volume, in the 1-in. size, 79.2 sq.ft. per cubic foot of packed volume (a correction of an editorial statement made in our October number). The ½-in. size gives a surface of 162 sq.ft. per cubic foot. U. S. Stoneware Co., New York, will show a new line of triple-spiral packing rings, as well as a new and unusual design of tower fillings characterized by minimum side pressure and low pressure drop, to be announced for the first time at the Exposition.

AND IN CONCLUSION—

WHAT HAS gone before, written as it is as a report, rather than as an interpretation, will have suggested that much ingenuity has gone into the efforts of exhibitors during the years since the last Chemical Exposition. It will have suggested, perhaps, what is a fact, that the Show will be somewhat larger than the last, and that manufacturers of equipment are approaching this newest display with renewed hope and new vigor. But it will not have indicated in particular just where equipment design as a whole is headed.

No very competent summary of trends can be made in the space at our disposal. Perhaps it is impossible to make a competent summary in a field as diversified as that of process equipment. Nevertheless, in one word, "stream-lining," we can epitomize the bulk of our observations. This much overworked expression connotes cleaner design, more attention to details, better engineering. It implies a trend toward standardization, in so far as possible, with concomitant reductions in cost and improvements in efficiency. It presupposes the better application of accessories, such as driving equipment—wherein recent years have seen the very extensive use of such neat improvements as the pivoted motor base, the V-belt drive and the geared-head motor. The phrase includes the rounding out of better fabrication methods and construction materials, as witness the virtually complete turn toward welding, or the now extensive application of the cheaper but equally useful ply metals. "Stream-lining," then, summarizes the trend, indicating much benefit for process industries.

Chemical Engineering NEWS

Heat Transmission Symposium At Yale

THE symposium on heat transmission to be held at Yale University under the auspices of the Chemical Engineering Department, continues the policy, inaugurated last December by the Industrial Division of the American Chemical Society, of holding special meetings for chemical engineering symposia. The previous meeting held at the Massachusetts Institute of Technology in December, 1934, featured a symposium on distillation. The last symposium on heat transmission held by the Society was in Washington in 1924. The committee in charge of the forthcoming meeting has selected this subject because of its wide appeal not only to all chemical engineers but also to many industrial chemists and to engineers in other fields.

The program includes the following papers: "Heating and Cooling Rectangular and Cylindrical Solids," Prof. Albert B. Newman, Cooper Union; "The Energy Reaction at Points in a Furnace Cavity for Steady State Firing," Prof. W. J. Wohlenberg, Yale University; "Correlation of Heat Transfer Coefficients in Forced Circulation Evaporators," Prof. W. L. Badger and Nathan Fragen, University of Michigan; "Heat Transmission with High Boiling Point Organic Compounds," E. F. Holster, Dow Chemical Co.; "Heat Transfer and Pressure Drop in Rectangular Air Passages," Prof. Lawrence Washington, Stanford University, and Max Marks, Standard Oil Co. of California; "Heat Insulation in Air Conditioning Systems," R. H. Heilman, Mellon Institute of Industrial Research; "Heat Transmission Coefficients of a Film-Type Horizontal Pipe Cooler," Prof. F. W. Adams, Massachusetts Institute of Technology; "Rates of Heat Transfer in the Condensation of Mixed Vapors," Prof. F. H. Rhodes, Cornell University; "Mean Temperature Difference Corrections in Multi-Pass Heat Exchanger," R. A. Bowman, Westinghouse Co.; "A Study of Factors Affecting Heat Transfer of Fluids in Viscous Flow Inside Pipes," E. N. Sieder, Foster-Wheeler Corp.; "Heat Transfer in Tubes at Various Inclinations," Prof. G. H. Montillon, University of Minnesota; "A Demonstration of the Hydrocal (A New Hydrodynamic Calculating Instrument for Solving Heat Transfer and Temperature Rise Problems in the Transient State)," Prof. A. D. Moore, University of Michigan.

New Plants Will Expand Chlorine Production

LAST month it was announced that the Allied Chemical & Dye Corp. is constructing a plant at Hopewell, Va., for production of chlorine and nitrate of soda. According to the report the new plant will cost about $1,000,000, will be ready for operation in the first half of next year, and will have a rated capacity of 25 tons of chlorine daily. The process to be followed calls for a treatment of salt brine with nitric acid. See *Chem. & Met.*, October, 1935, pp. 537-538.

Soon after announcement was made to the effect that plans were being drawn by the Columbia Chemical Division of the Pittsburgh Plate Glass Co. for an addition to its plant at Barberton, Ohio, the new unit to cost $1,250,000 and to be used for the manufacture of chlorine.

Two Business Census In Project

TWO CENSUS projects of interest to business are in the making at Washington. One is the regular biennial census of manufactures. The other is the WPA census of business designed to aid white collar workers out of employment.

The biennial census of manufactures covers, in general, those manufacturing industries which are operated on what may be termed the factory basis, together with the printing and publishing industry. All establishments whose business during the census year amounted to $5,000 or more are required to report.

Program for Students Course At Chemical Show

DURING the forthcoming Fifteenth Exposition of Chemical Industries at Grand Central Palace, New York, Dec. 2-7, the course of lectures for students of chemistry will again be conducted by the Educational Division of the Exposition under the chairmanship of Dr. W. T. Read, a member of the Exposition Advisory Committee and Dean of Chemistry at Rutgers University.

The preliminary program as announced includes the following: Dec. 2, 2:30 p.m.: Discussion by Dr. Read on "What There is to See in the Exposition and How to See It"; Dec. 3, 9:00 a.m.: A. W. Hixson, "Critical Periods in the Life History of Chemical Processes"; A. E. Marshall, "1950"; H. E. Howe, "What Chemistry Expects from the Young Chemist"; Dec. 4, 9:00 a.m.: G. J. Esselen, "Chemical Research as Business Insurance"; E. R. Weidlein, "Whither Industrial Research?"; A. C. Fieldner, "The Classification of Coal in Relation to Its Composition and Utilization."

Dec. 5, 9:00 a.m.: J. G. Vail, "Silicate Solutions in Industry—Finding New Ways of Using Them"; F. G. Breyer, "The Profession and the Depression"; Dec. 6, 9:00 a.m.: Williams Haynes, "Chemicals in Commerce"; Gustav Egloff, "Modern Cracking Processes"; S. D. Kirkpatrick, "Why an Award for Chemical Engineering Achievement?"; Dec. 7, 9:00 a.m.: H. C. Parmelee, "Professional Development"; W. S. Landis, "Chemistry & Economics"; F. C. Whitmore, "What Does the Employer Expect of a Chemist?"

Crosby Field will speak on "Effects of Changing Economic Conditions on the Young Chemical Engineer," and other speakers will also be included in the program but at the time of going to press the titles and periods have not been determined. Special cards for admission to the morning program must be secured in advance.

Each afternoon of the week at 1:30 p.m. (except Monday at 2:30 p.m.) there will be a lecture for the prime benefit of students of chemistry who have had little previous training to inform them on "What There is to See in the Exposition and How to See It."

A committee of teachers and chemical engineers in the metropolitan area are cooperating and preparing plans for conference and round table discussions, probably supplemented by some special lectures for advanced and graduate students in chemical engineering in the afternoon.

A teachers' subscription luncheon is being planned, probably for Saturday, Dec. 7.

Chemical Industry Medal Awarded Dr. E. R. Weidlein

THE Chemical Industry Medal for 1935 was presented on Nov. 8 to Dr. Edward R. Weidlein, Director of Mellon Institute of Industrial Research, Pittsburgh, Pa., at a meeting of the American Section of the Society of Chemical Industry, held at The Chemists' Club, New York. The meeting was held jointly with the American Chemical Society. Dr. L. V. Redman first gave a short talk outlining the accomplishments of Dr. Weidlein that had merited this award. The presentation was then made by Dr. D. D. Jackson of Columbia University.

In accepting the medal Dr. Weidlein told about some of the scientific investi-

Dr. E. R. Weidlein

gations at the institution that were evidently accorded recognition in the award of the medal. His address was entitled "Various Results of Being Researchful." He said that Mellon Institute has shown about 3,600 American companies, either as individuals or as members of industrial associations, that scientific research, properly carried out, is profitable to them. Most of the problems accepted for study, 1911-1935, have been solved satisfactorily. The Institute has also been active in stimulating research in other laboratories and in collaborating with other research establishments, both in the United States and abroad. It is best known, however, by the commercial processes that it has evolved (582 U. S. patents) and by its additions to the literature of chemistry and allied sciences (18 books, 122 bulletins, and 1,727 papers). During the past twenty-four years the Institute has received over $10,000,000 from industrial fellowship donors to defray the cost of scientific investigations conducted for these companies and associations.

Dr. Weidlein described ten new industries that have come from researches at Mellon Institute. He then gave accounts of the institution's notable investigations on processing, on developing new products, on advancing industrial operations, on finding new uses for old industrial products, on standardization, on subjects for the benefit of the public, and on important chemical problems of strictly scientific interest.

Industrial Conference at Washington, Dec. 9

A NUMBER of industrial organizations that might be classified as chemical have accepted Major George L. Berry's invitation to the Washington conference on Dec. 9 to determine for capital and labor what sort of government regulation shall succeed the defunct Blue Eagle.

The industries in the chemical and metallurgical fields that were among the 73 per cent of answers to the invitation (23 per cent of the answers were classified as non-committal) that accepted are: National Paint, Varnish and Lacquer Association, Folding Paper Box Association of America, Candle Manufacturing Association, Asphalt Shingle and Roofing Institute, Eastern Leatherboard Conference, Distilled Spirits Institute, National Fibre Can and Tube Association, Carbon Dioxide Institute, Pyrotechnic Industries, Inc., Bristol Board Manufacturers, Brake Lining Manufacturers Association, National Lime Association, Asbestos Institute, National Association Printing Ink Manufacturers, Cardboard Manufacturers Association, American Glassware Association, National Paperboard Association, Railroad Special Track Equipment Manufacturing Industry, League of Distilled Spirits Rectifiers Inc., Fibre Board Manufacturers Association, Gray Iron Founders Society, Inc., National Paper Trade Association, National Fertilizer Association, and Malleable Founders Society.

Institute of Technology Formed at Minnesota

AN Institute of Technology has been established by the University of Minnesota, by merger of the College of Engineering with the School of Chemistry and the School of Mines and Metallurgy and the Mines Experimental Station. Dr. S. C. Lind, who has been director of the School of Chemistry, has been made dean of the Institute. No plans for reorganization and enlargement of the technologic activities at Minnesota have yet been announced. It is expected, however, that the closer coordination of the engineering work and the encouragement of industrial cooperation on engineering problems will be of significant advantage to chemical engineering as well as to the other branches of educational work.

Sugar Refinery in Auction Sale

A SYNDICATE headed by A. M. Kahn, president of the Consolidated Products Co., Inc., New York, was the successful bidder at the public auction of the Spreckels Sugar Corp., including land, plant and all physical assets, held at Yonkers, Sept. 15, by the Southern District Court of New York. Bids were received for the property as a whole and on separate parcels, but all of these except the one submitted by the Kahn group were rejected after hearing by Judge John C. Knox.

The successful bid was $220,000 in cash subject to liens by the city of Yonkers for more than $550,000 in unpaid taxes, interest and penalties. Associated with Mr. Kahn in the syndicate is Edgar H. Stone, former vice-president of the Spreckels corporation. The plans of the new owners are to dispose of the property if possible as a going concern. Negotiations to that end are reported already to be on foot with various interested parties.

Warren K. Lewis to Receive Perkin Medal

THE Perkin Medal Committee has unanimously elected Warren K. Lewis of the Massachusetts Institute of

Warren K. Lewis

Technology to receive the Perkin Medal for 1936.

This medal is awarded annually by The Society of Chemical Industry to a medallist elected by a committee representing the five chemical societies in the United States. The award is made for valuable work in applied chemistry.

The medal will be presented on January 10, at a meeting to be held at The Chemists' Club, New York. The subject of Professor Lewis' paper will be, "Application of Physical Data to High Pressure Processes."

NEWS FROM WASHINGTON

By PAUL WOOTON

Washington Correspondent of Chem. & Met.

THE EMERGENCY is over. President Roosevelt says so. Hence, planning, which continues unabated in Washington, becomes planning for reform rather than planning for relief. The political angle, with a forward view to 1936, merely supersedes the old relief and re-employment aspects.

Budget making is the current problem of the greatest industrial interest. But major uncertainties make even the President's personal decisions only tentative. Effort will be made to come near to balance on the budget which will apply to 1936-37 spending; but close approach to balance is not expected even by the most optimistic of the New Deal supporters. The President clearly implied that promises for even 1938 balancing were premature, in his laughing reprimand addressed to Under-secretary Tugwell, as expressed at a recent press conference.

It is important, even at this time, for business to note some of the big factors effecting the degree of unbalance. Enactment of the Veterans' bonus bill for cash settlement, expected in January, will represent a real burden which the President, for diplomatic reasons, will certainly not include in his budget. The expected failure of the Supreme Court to permit the continued collection of processing taxes under AAA, may also add another half billion to the needed income. No careful forecaster omits provision of say $2 billion for continued relief and WPA type of employment service. Several other anticipated, but perhaps not budgeted, items add up to $4 billion or more of uncertainty.

Farm Chemurgic

The AAA appears to be tending toward the Farm Chemurgic. At least it looks longingly at possible industrial markets as a potential outlet for products to be made from potatoes. Administration of the "hot potato" act by Secretary Wallace is leading to a plan for the purchase of the surplus. But potatoes, unlike cotton, may not be stored in the "ever normal granary" for subsequent use in a shortage period. They must be converted into something less perishable.

No definite plans have yet been made for processing spuds. Starch-making, to give a substitute for imported material used extensively in paper and textile industry, has been considered. Power alcohol, obviously an adequately large outlet, apparently does not intrigue the planters, because it would require new capital investment in plants without any assurance of continuing supplies of the tubers at twenty cents a bushel, unless direct money subsidy is to be promised. The latest proposal to AAA is that acetic acid be made. Though seriously proposed, this idea probably will not materialize in any processing.

Pending any decision on these technical matters, the agricultural-economic planners continue the thankless task of potato management. Their greatest worry rightly is as to what the housewife is going to say regarding the market-basket price effects.

Patent Problems

Process patents must be accompanied by product patents if American industry is fully to be protected under the present laws regarding import of goods made by patented process. This is the clear significance of the decision late in October by the Court of Customs and Patent Appeals with respect to apatite.

The court ruled that although the imported goods were made by a process which is covered by patents in the United States, they could not be embargoed under the present tariff act, Section 337, because there were no product patents covering materials produced by this patented process. Hence, the importing company, in this case the Soviet Amtorg, was not violating any American law in bringing in the result of such processing. Washington believes that Congress may be willing to stop this gap in the protection of American patent-holders.

The hearings of the House Committee on Patents regarding cross-licensing practices have stirred up several hornets' nests. At one time it appeared that the committee was so embarrassed by discovering two of its employees as having fiancial interest in cases being investigated, that it might discontinue the hearings. However, Dr. William I. Sirovich, chairman, now indicates that he will continue hearings, taking up other phases of the patent situation, perhaps even continuing the aircraft inquiry. It can be expected that either this, or some other form of inquiry, will be pressed to the point of determining legislative possibilities for the next Congress with respect to limits on cross-licensings. All industries interested in patent pools of any sort must give the matter serious attention, regardless of the outcome of the Sirovich hearings.

Trade Practices

Effort continues to add a few more lives to the Blue Eagle, but without much success. However, the bird refuses to stay altogether dead. Among the industrial groups working through the Federal Trade Commission on codes which include labor provisions, are several minor industries of chemical interest. Also the fertilizer industry, which is the largest group active of the process industries, is vigorously pressing on labor as well as trade provisions. NRA will, of course, review the labor sections of any such proposed codes, as described in *Chem. & Met.* last month.

Major George L. Berry, coordinator for industrial co-operation, has not received much encouragement from industrial groups in answer to his widely circulated form letter which it was hoped would stir new support for labor measures in codes.

International Problems

Maintenance of neutrality at any cost continues the plan of the Administration. Although ardently a Big-Navy advocate, the President, probably rightly, accepts as the judgment of the American people as a desire to avoid any form of trading with belligerents that might jeopardize American peace. Under these circumstances, some additions to the restrictions on movement of wanted material for belligerents seems certain.

The speed and direction of munitions-control changes will perhaps depend most on policies made by the League at Geneva. Messrs. Roosevelt and Hull at Washington, for political reasons, would much prefer to follow League leadership in these details. Perhaps the embarrassment of deciding whether copper and cotton are munitions may be escaped by establishing effective economic barricades about Italy through League action in the Mediterranean. Such limitation of trade, without the necessity of Presidential decision in these matters, would presumably be most welcome at the White House.

Weekly, Washington has expected announcement from the State Department of further bilateral tariff pacts. Most of concern to chemical industry, and anxiously awaited, is the Swiss trade agreement. The Canadian pact, also long expected, appears now somewhat delayed as the result of the new government coming into power at Ottawa.

The MARKETS

TRADING in chemicals in the last month has been featured by a substantial gain in contract placements calling for delivery over parts of the coming year. In some instances these contracts call for delivery over the first quarter of the year and in other cases the contracts cover a longer period. A short time ago it was announced that one consumer had covered sulphuric acid requirements for a period of ten years.

Prices for most of the important chemicals have been extended to cover 1936 business. Phosphates of soda have been offered at a decline but competition has been keen for a long time and the revised prices merely bring quotations down to the actual selling price.

Production of chemicals in the final quarter of this year has been stimulated by the greater than seasonal activities in some lines. For instance, the pushing ahead of automotive production schedules not only aided the chemical industry by increasing the demand for the numerous chemical products incident to such manufacture but likewise has helped to maintain plate glass production on a high plane and thus cause a steady movement of chemicals to glass manufacturers.

Production of 116,666,553 lb. of linseed oil by 29 mills in the United States during the third quarter ended Sept. 30, compared with an output of 85,037,681 lb. during the same period last year, was announced by the Bureau of Census on Oct. 24.

Consumption of crude rubber by manufacturers in the United States totaled 37,553 tons in September, against 39,242 tons in August, a decline of 4.3 per cent, but 24.1 per cent higher than consumption in September last year, according to estimates by the Rubber Manufacturers Association, Inc. Consumption in September last year totaled 30,258 long tons. A gain in production and consumption of reclaimed rubber also is expected to be disclosed when the figures for October operations become available.

United States production of benzol estimated by the Bureau of Mines from the production of coke at byproduct ovens known to recover this commodity totaled 55,996,000 gal. in the Jan.-Sept., 1935, period compared with 52,557,000 gal. during the first nine months of 1934. The term benzol represents crude and refined benzol plus all motor benzol.

Exports of chemicals and allied products were maintained in September at the high level established during the preceding month and were more than 10 per cent above the record of September, 1934. The value of such exports totaled $12,030,000 in September compared with $12,204,000 for August and $10,885,000 in September last year, preliminary statistics show. Imports of chemical products amounted to $7,361,350 in September.

Chemical exports were featured by heavier shipments of rosin, essential oils, and phosphate rock, and the foreign demand for American sulphur continued weak. Exports of sulphur amounted to only 34,178 tons valued at $660,000 during the month.

Industrial chemicals led the export list with shipments valued at $1,860,050, compared with $1,781,850 for September last year. This group was followed closely by fertilizer materials valued at $1,851,730, an advance of $580,250 over September, 1934, and the quantity shipped increased from 109,980 to 208,797 tons. The increase was due largely to heavier shipments of phosphate rock.

Work on the plant being constructed at Sagua la Grande, Cuba, for the production of caustic soda, hydrochloric acid, and chlorine, has recently been suspended, according to reports from Habana. The reason for this action is not known. Orders for imported caustic soda, hydrochloric acid and chlorine, for use during the coming sugar-grinding season, are, therefore, not likely to be affected.

German official export statistics for sodium sulphate and bisulphate show an increase to 88,323 metric tons during the first seven months of 1935 from 68,114 tons in the corresponding period of 1934. Chief markets in 1935 were: United States, 31,431 tons; Sweden, 24,226 tons; Finland, 11,617 tons; and Belgium, 4,437 tons.

Production and Consumption Data for Chemical-Consuming Industries

	Sept. 1935	Sept. 1934	Jan.-Sept. 1935	Jan.-Sept. 1934	Gain Jan.-Sept. 1935 over Jan.-Sept. 1934 Per Cent
Production					
Alcohol denatured, 1,000 wi. gal.	10,211	9,841	62,089	57,096	8.7
Automobiles, No.	89,805	170,007	2,929,045	2,384,014	22.9
Byproduct coke, 1,000 tons	2,836	2,171	24,737	23,203	6.6
Glass containers, 1,000 gr.	3,107	2,859	28,840	26,745	7.8
Plate glass, 1,000 sq.ft.	14,404	6,738	131,202	69,319	89.3
Methanol, crude, gal.	368,936	260,402	3,180,533	2,799,542	13.6
Methanol, synthetic, gal.	1,539,554	1,079,910	11,509,682	8,133,527	41.5
Nitro cellulose plastics, 1,000 lb.	1,551	841	11,778	9,192	28.1
Cellulose acetate plastics, 1,000 lb.	882	393	6,992	3,608	93.8
Paper board, tons	390,840	380,272	3,626,875	3,505,235	3.5
Pyroxylin spread, 1,000 lb.	4,692	3,294	38,391	33,994	12.9
Steel barrels, No.	623,797	412,592	4,821,604	5,203,487	7.3*
Sulphuric acid in fertilizer trade, tons	130,260	116,120	1,178,341	1,037,703	13.4
Consumption					
Cotton, 1,000 bales	449	295	4,073	4,001	1.8
Silk, bales	45,156	32,599	376,405	334,111	12.7
Explosives, 1,000 lb.	27,940	25,489	203,414	218,834	7.5*
Paint, varnish, and lacquer sales, $1,000	28,436	21,715	257,101	216,747	18.6
Sulphuric acid in fertilizer trade, tons	101,708	85,915	953,886	963,142	0.1*

*Per cent of decline.

CHEM. & MET. Weighted Index of CHEMICAL PRICES

Base = 100 for 1927

This month	**87.20**
Last month	87.01
November, 1934	87.91
November, 1933	86.82

Lower prices ruled for butyl alcohol and phosphates of soda. Stronger markets were reported for tin and lead salts, turpentine, mercury, naphthalene, and casein. Net effect was a moderate rise in the weighted index.

CHEM. & MET. Weighted Index of Prices for OILS AND FATS

Base = 100 for 1927

This month	**92.20**
Last month	94.08
November, 1934	74.55
November, 1933	53.11

Tallow and animal fats held a firm price position throughout the month but lower prices were effective on crude cottonseed and China wood oils. Coconut and palm oils also were weaker and the index moved downward.

Current PRICES

The following prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. works, quotations are given on that basis and are so designated. Prices are corrected to Nov. 13.

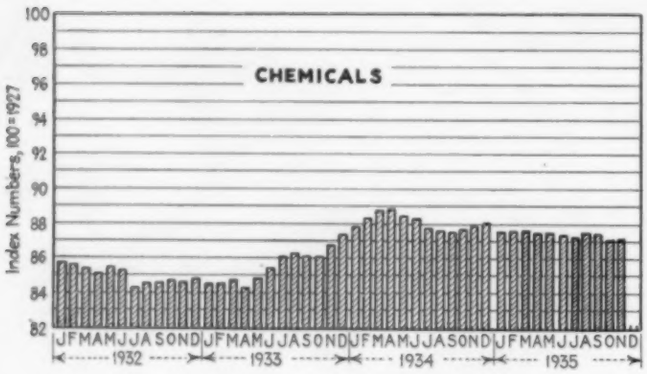
Industrial Chemicals

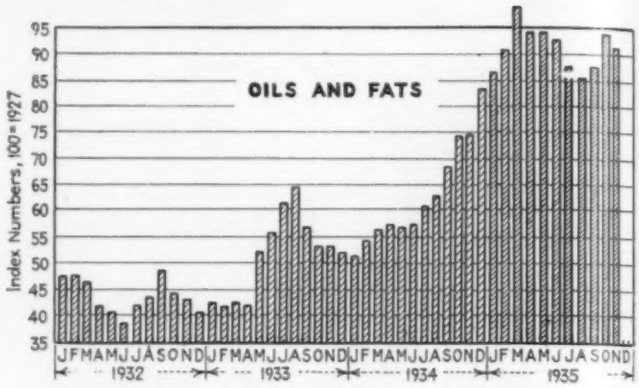
	Current Price	Last Month	Last Year
Acetone, drums, lb.	$0.12 –$0.12½	$0.12 –$0.12½	$0.12 –$0.12½
Acid, acetic, 28%, bbl., cwt.	2.45 – 2.70	2.45 – 2.70	2.40 – 2.55
Glacial 99%, drums	8.43 – 8.68	8.43 – 8.68	8.25 – 8.50
U. S. P. reagent	10.52 –10.77	10.52 –10.77	10.52 –10.77
Boric, bbl., ton	105.00–115.00	105.00–115.00	95.00 –105.00
Citric, kegs, lb.	.28 – .31	.28 – .31	.28 – .31
Formic, bbl., ton	.11 – .11½	.11 – .11½	.11 – .11½
Gallic, tech., bbl., lb.	.60 – .65	.60 – .65	.60 – .65
Hydrofluoric 30% carb., lb.	.07 – .07½	.07 – .07½	.07 – .07½
Lactic, 44%, tech., light, bbl., lb.	.12 – .12½	.12 – .12½	.12 – .12½
22%, tech., light, bbl., lb.	.06½– .07	.06½– .07	.06½– .07
Muriatic, 18°, tanks, cwt.	1.00 – 1.10	1.00 – 1.10	1.00 – 1.10
Nitric, 36°, carboys, lb.	.05 – .05½	.05 – .05½	.05 – .05½
Oleum, tanks, wks., ton	18.50 –20.00	18.50 –.....	18.50 –20.00
Oxalic, crystals, bbl., lb.	.11½– .12½	.11½– .12½	.11½– .12½
Phosphoric, tech., c'bys., lb.	.09 – .10	.09 – .10	.09 – .10
Sulphuric, 60°, tanks, ton	11.00 –11.50	11.00 –11.50	11.00 –11.50
Sulphuric, 66°, tanks, ton	15.50 –.....	15.50 –.....	15.50 –.....
Tannic, tech., bbl., lb.	.23 – .35	.23 – .35	.23 – .35
Tartaric, powd., bbl., lb.	.24 – .25	.24 – .25	.25 – .26
Tungstic, bbl., lb.	1.50 – 1.60	1.50 – 1.60	1.40 – 1.50
Alcohol, Amyl	–.....	–.....	–.....
From Pentane, tanks, lb.	.15 –.....	.15 –.....	.143–.....
Alcohol, Butyl, tanks, lb.	.12 –.....	.13 –.....	.12 –.....
Alcohol, Ethyl, 190 p'f., bbl., gal.	4.27½–.....	4.27½–.....	4.15½–.....
Denatured, 190 proof			
No. 1 special, dr., gal.	.36 –.....	.36 –.....	.346–.....
No. 5, 188 proof, dr., gal.	.35½–.....	.35½–.....	.34 –.....
Alum, ammonia, lump, bbl., lb.	.03 – .04	.03 – .04	.03 – .04
Chrome, bbl., lb.	.04½– .05	.04½– .05	.04½– .05
Potash, lump, bbl., lb.	.03 – .04	.03 – .04	.03 – .04
Aluminum sulphate, com., bags cwt.	1.35 – 1.50	1.35 – 1.50	1.35 – 1.50
Iron free, bg., cwt.	1.90 – 2.00	1.90 – 2.00	1.90 – 2.00
Aqua ammonia, 26°, drums, lb.	.02½– .03	.02½– .03	.02½– .03
tanks, lb.	.02½– .02¾	.02½– .02¾	.02½– .02¾
Ammonia, anhydrous, cyl., lb.	.15½– .16	.15½– .16	.15½– .16
tanks, lb.	.04½–.....	.04½–.....	.04½–.....
Ammonium carbonate, powd. tech., casks, lb.	.08 – .12	.08 – .12	.08 – .12
Sulphate, wks., cwt.	1.20 –.....	1.20 –.....	1.20 –.....
Amylacetate tech., tanks, lb.	.142–.....	.142–.....	.142–.....
Antimony Oxide, bbl., lb.	.14 – .14½	.12½– .12¾	.09½– .09¾
Arsenic, white, powd., bbl., lb.	.03½– .04	.03½– .04	.03½– .04
Red, powd., kegs, lb.	.15½– .16	.15½– .16	.15½– .16
Barium carbonate, bbl., ton	56.50 –58.00	56.50 –58.00	56.50 –58.00
Chloride, bbl., ton	72.00 –74.00	72.00 –74.00	74.00 –75.00
Nitrate, cask, lb.	.08½– .09	.08½– .09	.08½– .09
Blanc fixe, dry, bbl., lb.	.03½– .04	.03½– .04	.03½– .04
Bleaching powder, f.o.b., wks., drums, cwt.	2.00 – 2.10	1.90 – 2.00	1.85 – 2.00
Borax, gran., bags, ton	44.00 –49.00	44.00 –49.00	40.00 –45.00
Bromine, cs., lb.	.36 – .38	.36 – .38	.36 – .38
Calcium acetate, bags	2.10 –.....	2.10 –.....	2.00 –.....
Arsenate, dr., lb.	.06 – .07	.06 – .07	.05 – .06
Carbide drums, lb.	.05 – .06	.05 – .06	.05 – .06
Chloride, fused, dr., del., ton.	20.00 –33.00	20.00 –33.00	17.50 –.....
flake, dr., del., ton.	22.00 –35.00	22.00 –35.00	19.50 –.....
Phosphate, bbl., lb.	.07½– .08	.07½– .08	.07½– .08
Carbon bisulphide, drums, lb.	.05½– .08½	.05½– .06	.05½– .06
Tetrachloride drums, lb.	.05½– .08½	.05½– .06	.05½– .06
Chlorine, liquid, tanks, wks., lb.	2.15 –.....	2.00 –.....	.0185–.....
Cylinders	.05½– .06	.05½– .06	.05½– 06
Cobalt oxide, cans, lb.	1.39 – 1.45	1.39 – 1.45	1.25 – 1.30
Copperas, bgs., f.o.b., wks., ton	14.00 –15.00	14.00 –15.00	14.00 –15.00
Copper carbonate, bbl., lb.	.08½– .16	.08½– .16	.08½– .16
Cyanide, tech., bbl., lb.	.37 – .38	.37 – .38	.37 – .38
Sulphate, bbl., cwt.	3.85 – 4.00	3.85 – 4.00	3.85 – 4.00
Cream of tartar, bbl., lb.	.16½– .17	.16½– .17	.18½– .19
Diethylene glycol, dr., lb.	.16½– .20½	.16½– .20½	.14 – .16
Epsom salt, dom., tech., bbl., cwt.	2.10 – 2.15	2.10 – 2.15	2.10 – 2.15
Imp., tech., bags, cwt.	2.00 – 2.10	2.00 – 2.10	2.00 – 2.10
Ethyl acetate, drums, lb.	.08½–.....	.08½–.....	.08½–.....
Formaldehyde, 40%, bbl., lb.	.06 – .07	.06 – .07	.06 – .07
Furfural, dr., contact, lb.	.10 – .17½	.10 – .17½	.10 – .17½
Fusel oil, crude, drums, gal.	.75 –.....	.75 –.....	.75 –.....
Refined, dr., gal.	1.25 – 1.30	1.25 – 1.30	1.25 – 1.30
Glaubers salt, bags, cwt.	1.00 – 1.10	1.00 – 1.10	1.00 – 1.10
Glycerine, c.p., drums, extra, lb.	.14 – .14½	.14 – .14½	.14 – .14½
Lead:			
White, basic carbonate, dry casks, lb.	.06½–.....	.06½–.....	.06½–.....
White, basic sulphate, sck., lb.	.06 –.....	.06 –.....	.06 –.....
Red, dry, sck., lb.	.07 –.....	.06½–.....	.06½–.....
Lead acetate, white crys., bbl., lb.	.10½– .11	.10½– .11	.10½– .11
Lead arsenate, powd., bbl., lb.	.09 – .10	.09 – .10	.09 – .10
Lime, chem., bulk, ton	8.50 –.....	8.50 –.....	8.50 –.....
Litharge, pwd., csk., lb.	.06 –.....	.05½–.....	.05½–.....
Lithophone, bags, lb.	.04½– .05	.04½– .05	.04½– .05
Magnesium carb., tech., bags, lb.	.06 – .06½	.06 – .06½	.06 – .06½
Methanol, 95%, tanks, gal.	.33 –.....	.33 –.....	.33 –.....
97%, tanks, gal.	.34 –.....	.34 –.....	.34 –.....
Synthetic, tanks, gal.	.35½–.....	.35½–.....	.35½–.....
Nickel salt, double, bbl., lb.	13 – .13½	.13 – .13½	.11½– .12
Orange mineral, csk., lb.	.10 –.....	.09½–.....	.09½–.....
Phosphorus, red, cases, lb.	.44 – .45	.44 – .45	.44 – .45
Yellow, cases, lb.	.28 – .32	.28 – .32	.28 – .32
Potassium bichromate, casks, lb.	.07½– .08½	.07½– .08½	.07½– .08½
Carbonate, 80-85%, calc. csk., lb.	.07 – .07½	.07 – .07½	.07 – .07½
Chlorate, powd., lb.	.08½– .09	.08½– .09	.09½– .10
Hydroxide (caustic potash) dr., lb.	.06½– .06½	.06½– .06½	.06½– .06½
Muriate, 80% bgs., ton	22.00 –.....	22.00 –.....	22.00 –.....
Nitrate, bbl., lb.	.05½– .06	.05½– .06	.05½– .06
Permanganate, drums, lb.	.18½– .19	.18½– .19	.18½– .19
Prussiate, yellow, casks, lb.	.18 – .19	.18 – .19	.18 – .19
Sal ammoniac, white, casks, lb.	.04½– .05	.04½– .05	.04½– .05
Salsoda, bbl., cwt.	1.00 – 1.05	1.00 – 1.05	1.00 – 1.05
Salt cake, bulk, ton	13.00 –15.00	13.00 –15.00	13.00 –15.00
Soda ash, light, 58%, bags, contract, cwt.	1.23 –.....	1.23 –.....	1.23 –.....
Dense, bags, cwt.	1.25 –.....	1.25 –.....	1.25 –.....
Soda, caustic, 76%, solid, drums, contract, cwt.	2.60 – 3.00	2.60 – 3.00	2.60 – 3.00
Acetate, works, bbl., lb.	.04½– .05	.04½– .05	.04½– .05
Bicarbonate, bbl., cwt.	1.85 – 2.00	1.85 – 2.00	1.85 – 2.00
Bichromate, casks, lb.	.05½– .06½	.05½– .06½	.05½– .06½
Bisulphate, bulk, ton	15.00 –16.00	15.00 –16.00	14.00 –16.00
Bisulphite, bbl., lb.	.03½– .04	.03½– .04	.03 – .04
Chlorate, kegs, lb.	.06½– .06½	.06½– .06½	.06½– .06½
Chloride, tech., ton	12.00 –14.75	12.00 –14.75	12.00 –14.75
Cyanide, cases, dom., lb.	.15½– .16	.15½– .16	.15½– .16
Fluoride, bbl., lb.	.07½– .08	.07½– .08	.07½– .08
Hyposulphite, bbl., lb.	2.40 – 2.50	2.40 – 2.50	2.40 – 2.50
Metasilicate, bbl., cwt.	3.25 – 3.40	3.25 – 3.40	3.25 – 3.40
Nitrate, bags, cwt.	1.275–.....	1.275–.....	1.24 –.....
Nitrite, casks, lb.	.07½– .08	.07½– .08	.07½– .08
Phosphate, dibasic, bbl., lb.	.022– .023	.023– .024	.022– .024
Prussiate, yel. drums, lb.	.11½– .12	.11½– .12	.11½– .12
Silicate (40° dr.) wks., cwt.	.80 – .85	.80 – .85	.80 – .85
Sulphide, fused, 60-62%, dr., lb.	.02½– .03½	.02½– .03	.02½– .03
Sulphite, cyrs., bbl., lb.	.02½– .02½	.02½– .02½	.02½– .02½
Sulphur, crude at mine, bulk, ton	18.00 –.....	18.00 –.....	18.00 –.....
Chloride, dr., lb.	.03½– .04	.03½– .04	.03½– .04
Dioxide, cyl, lb.	.07 – .07½	.07 – .07½	.07 – .07½
Flour, bag, cwt.	1.60 – 3.00	1.60 – 3.00	1.60 – 3.00
Tin Oxide, bbl., lb.	.54 –.....	.53 –.....	.56 –.....
Crystals, bbl., lb.	.38½–.....	.38 –.....	.38 –.....
Zinc chloride, gran., bbl., lb.	.05 – .06	.05 – .06	.05½– .06
Carbonate, bbl., lb.	.09 – .11	.09½– .11	.09½– .11
Cyanide, dr., lb.	.36 – .38	.36 – .38	.38 – .42
Dust, bbl., lb.	.069– .07	.066– .07	.059– .07
Zinc oxide, lead free, bag, lb.	.05 –.....	.05 –.....	.06½–.....
5% lead sulphate, bags, lb.	.04½–.....	.04½–.....	.06½–.....
Sulphate, bbl., cwt.	2.65 – 3.00	2.65 – 3.00	2.75 – 3.00

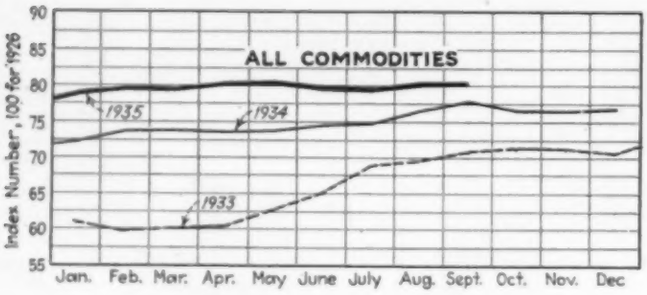
Oils and Fats

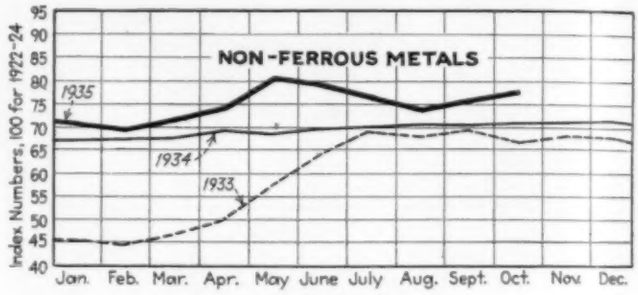
	Current Price	Last Month	Last Year
Castor oil, No. 3, bbl., lb.	$0.10 –$0.11	$0.09½–$0.10	$0.09½–$0.10
Chinawood oil, bbl., lb.	.19 –.....	.35 –.....	.08½–.....
Coconut oil, Ceylon, tanks, N. Y. lb.	.04½–.....	.05 –.....	.03½–.....
Corn oil crude, tanks, (f.o.b mill), lb.	.09½–.....	.09½–.....	.07½–.....
Cottonseed oil, crude (f.o.b. mill), tanks, lb.	.08½–.....	.09½–.....	.07½–.....
Linseed oil, raw car lots, bbl., lb.	.097–.....	.097–.....	.087–.....
Palm, casks, lb.	.04½–.....	.05 –.....	.03½–.....
Palm kernel, bbl., lb.	.05½–.....	.05½–.....	.03½–.....
Peanut oil, crude, tanks (mill), lb.	.09½–.....	.09½–.....	.07½–.....
Rapeseed oil, refined, bbl., gal.	.52 – .53	.50 – .52	.41 – .42
Soya bean, tank, lb.	.09 –	.08½–.....	.06½–.....
Sulphur (olive foots), bbl., lb.	.09½–.....	.10 –.....	.07½–.....
Cod, Newfoundland, bbl., gal.	.35 –.....	.35 –.....	.38 –.....
Menhaden, light pressed, bbl., lb	.072–.....	.068–.....	.056–.....
Crude, tanks (f.o.b. factory), gal.	.32 –.....	.32 –.....	.22 –.....
Grease, yellow, loose, lb.	.06½–.....	.06½–.....	.04½–.....
Oleo stearine, lb.	.11½–.....	.11½–.....	.08½–.....
Red oil, distilled, d.p. bbl., lb.	.09½–.....	.09½–.....	.07 –.....
Tallow, extra, loose, lb.	.07½–.....	.07½–.....	.04½–.....

CHEM. & MET.'S WEIGHTED PRICE INDEXES









Coal-Tar Products

	Current Price	Last Month	Last Year
Alpha-naphthol, crude, bbl., lb.	$0.60 –$0.65	$0.60 –$0.65	$0.60 –$0.62
Refined, bbl., lb.	.80 – .85	.80 – .85	.80 – .85
Alpha-naphthylamine, bbl., lb.	.32 – .34	.32 – .34	.32 – .34
Aniline oil, drums, extra, lb.	.14½– .15	.14½– .15	.14½– .15
Aniline salts, bbl., lb.	.24 – .25	.24 – .25	.24 – .52
Benzaldehyde, U.S.P., dr., lb.	1.10 – 1.25	1.10 – 1.25	1.10 – 1.25
Benzidine base, bbl., lb.	.65 – .67	.65 – .67	.65 – .67
Benzoic acid, U.S.P., kgs., lb.	.48 – .52	.48 – .52	.48 – .52
Benzyl chloride, tech., dr., lb.	.30 – .35	.30 – .35	.30 – .35
Benzol, 90%, tanks, works, gal.	.15 – .16	.15 – .16	.19 – .20
Beta-naphthol, tech., drums, lb.	.22 – .24	.22 – .24	.22 – .24
Cresol, U.S.P., dr., lb.	.11 – .11½	.11 – .11½	.11 – .11½
Cresylic acid, 97%, dr., wks., gal.	.45 – .46	.42 – .43	.50 – .51
Diethylaniline, dr., lb.	.55 – .58	.55 – .58	.55 – .58
Dinitrophenol, bbl., lb.	.29 – .30	.29 – .30	.29 – .30
Dinitrotoluen, bbl., lb.	.16 – .17	.16 – .17	.16 – .17
Dip oil, 25%, dr., gal.	.23 – .25	.23 – .25	.23 – .25
Diphenylamine, bbl., lb.	.38 – .40	.38 – .40	.38 – .40
H-acid, bbl., lb.	.65 – .70	.65 – .70	.65 – .70
Naphthalene, flake, bbl., lb.	.07 – .07½	.05½– .06½	.06 – .07
Nitrobenzene, dr., lb.	.08½– .09	.08½– .09	.08½– .10
Para-nitraniline, bbl., lb.	.51 – .55	.51 – .55	.51 – .55
Phenol, U.S.P., drums, lb.	.14½– .15	.14½– .15	.14½– .15
Picric acid, bbl., lb.	.30 – .40	.30 – .40	.30 – .40
Pyridine, dr., gal.	1.10 – 1.15	1.10 – 1.15	1.10 – 1.15
Resorcinal, tech., kegs, lb.	.65 – .70	.65 – .70	.65 – .70
Salicylic acid, tech., bbl., lb.	.40 – .42	.40 – .42	.40 – .42
Solvent naphtha, w.w., tanks, gal.	.26 –.....	.26 –.....	.26 –.....
Tolidine, bbl., lb.	.88 – .90	.88 – .90	.88 – .90
Toluene, tanks, works, gal.	.30 –.....	.30 –.....	.30 –.....
Xylene, com., tanks, gal.	.30 –.....	.30 –.....	.26 –.....

Miscellaneous

	Current Price	Last Month	Last Year
Barytes, grid., white, bbl., ton	$22.00–$25.00	$22.00–$25.00	$22.00–$25.00
Casein, tech., bbl., lb.	.14 – .15	.12 – .13	.09½– .10
China clay, dom., f.o.b. mine, ton	8.00 –20.00	8.00 –20.00	8.00 –20.00
Dry colors:			
Carbon gas, black (wks.), lb.	.04 – .20	.04 – .20	.04 – .20
Prussian blue, bbl., lb.	.36½– .38	.36½– .38	.35½– .37
Ultramarine blue, bbl., lb.	.06 – .32	.06 – .32	.06 – .32
Chrome green, bbl., lb.	.26 – .27	.26 – .27	.26 – .27
Carmine red, tins, lb.	4.00 – 4.40	4.00 – 4.40	4.00 – 4.40
Para toner, lb.	.80 – .85	.80 – .85	.80 – .85
Vermilion, English, bbl., lb.	1.58 – 1.60	1.52 – 1.55	1.56 – 1.60
Chrome yellow, C. P., bbl., lb.	.14 – .16	.14 – .16	.15 – .15½
Feldspar, No. 1 (f.o.b. N.C.), ton.	6.50 – 7.50	6.50 – 7.50	6.50 – 7.50
Graphite, Ceylon, lump, bbl., lb.	.07 – .08½	.07 – .08½	.07 – .08½
Gum copal Congo, bags, lb.	.09 – .10	.09 – .10	.06 – .08
Manila, bags, lb.	.09 – .10	.09 – .10	.16 – .17
Damar, Batavia, cases, lb.	.15½– .16	.15½– .16	.16 – .16½
Kauri No. 1 cases, lb.	.20 – .25	.20 – .25	.45 – .48
Kieselguhr (f.o.b. N. Y.), ton.	50.00 –55.00	50.00 –55.00	50.00 –55.00
Magnesite, calc, ton.	50.00 –.....	50.00 –.....	40.00 –.....
Pumice stone, lump, bbl., lb.	.05 – .07	.05 – .08	.05 – .07
Imported, casks, lb.	.03 – .40	.03 – .40	.03 – .35
Rosin, H., bbl.	5.90 –.....	5.90 –.....	5.65 –.....
Turpentine, gal.	.51 –.....	.52½–	.53 –.....
Shellac, orange, fine, bags, lb.	.28 –.....	.28 –.....	.35 –.....
Bleached, bonedry, bags, lb.	.24 –.....	.24 –	.32 – .33
T. N. bags, lb.	.16 –.....	.16 –	.26 – .27
Soapstone (f.o.b. Vt.), bags, ton.	10.00 –12.00	10.00 –12.00	10.00 –12.00
Talc, 200 mesh (f.o.b. Vt.), ton.	8.00 – 8.50	8.00 – 8.50	8.00 – 8.50
300 mesh (f.o.b. Ga.), ton.	7.50 –10.00	7.50 –10.00	7.50 –11.00
225 mesh (f.o.b. N. Y.), ton.	13.75 –.....	13.75 –.....	13.75 –.....

INDUSTRIAL NOTES

THWING INSTRUMENT CO., Philadelphia, has changed its name to Thwing-Albert Instrument Co. This involves no change in ownership, management, policy or product.

THE CRANE CO., Chicago, has appointed Edmund Burke as manager of industrial sales. W. Howard Pape succeeds Mr. Burke as manager of sales to the oil and gas industries.

COMBUSTION ENGINEERING CO., INC., New York, announces that Otto de Lorenzi has been made assistant general sales manager of the company.

J. P. DEVINE MFG., CO., INC., Mt. Vernon, Ill., has elected the following officers: C. W. Reynolds, president; J. A. Guyer, executive vice-president; W. A. Jackson, secretary and treasurer; H. H. Cust, assistant secretary and assistant treasurer.

THE LEBANON STEEL FOUNDRY, Lebanon, Pa., has appointed Peter A. Frasse & Co., Inc., as sales representatives. The Frasse company has offices in six large eastern cities.

NATIONAL CARBON CO., INC., New York, has been appointed sales agent for the Soderberg electrode for the United States and Canada.

CHEMICAL SOLVENTS INC., New York, has been appointed sole distributors of completely denatured alcohol produced by Sucesion J. Serralles, Ponce, Puerto Rico.

PITTSBURGH PLATE GLASS CO., Pittsburgh, has made appropriation for building another manufacturing unit for its Ditzler Color Co.'s plant at Detroit.

AMERICAN MANGANESE STEEL CO., Chicago Heights, Ill., has elected William M. Black vice-president in charge of sales.

NEW ENGLAND TANK & TOWER CO. has moved its New York office to 11 West 42d St. Arthur E. Hall, vice-president of the company, is in charge of the office.

OWENS-ILLINOIS GLASS CO., Toledo, Ohio, has purchased the assets and business of the Libby Glass Mfg. Co.

THE STRUTHERS-WELLS CO., Warren, Pa., is now represented in the Cleveland district with an office at 1838 Euclid Ave. and with B. W. Rogers and P. M. Kline in charge.

New CONSTRUCTION

Where Plants Are Being Built in Process Industries

	Current Projects		Cumulative 1935	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	.....	.....	$964,000	$427,000
Middle Atlantic	$28,000	.....	3,230,000	3,231,000
South	155,000	$807,000	9,308,000	5,889,000
Middle West	695,000	90,000	12,120,000	9,113,000
West of Missippi	2,853,000	157,000	7,018,000	7,128,000
Far West	85,000	91,000	3,231,000	6,183,000
Canada	203,000	200,000	13,023,000	1,743,000
Total	$4,019,000	$1,345,000	$48,894,000	$33,714,000

PROPOSED WORK
BIDS ASKED

Chemical Plant—Thompson-Hayward Chemical Co., 2915 Southwest Blvd., Kansas City, Mo., is having plans prepared by R. N. Wakefield, Archt., 1012 Baltimore St., Kansas City, for an addition to its plant. Estimated cost $50,000.

Cyanamid Factory—American Cyanimid Corp., 30 Rockefeller Plaza, New York, N. Y., has acquired the plant formerly occupied by H. E. Verran Co., Post Rd., Stamford, Conn., a 12 acre site, and plans to recondition same for its own use.

Distillery—J. A. Barry Distillery Co., Ekron, Ky., plans to construct extensions to distillery here. Estimated cost including equipment $45,000.

Distillery—Cave Springs Distilling Co., Albert Mayer, Pres., Newport, Ky., is receiving bids for the construction of a distillery and warehouse. Glazier & Morlidge, 305 Walnut St., Cincinnati, O., Archts. Estimated cost $200,000.

Distillery—Empire Distilling Corp., 347 Madison Ave., New York, N. Y., has purchased the plant formerly occupied by the Syrup Products Co., Hudson River, Yonkers, N. Y., and plans to construct additions and extensions to increase capacity of plant for its own use. Estimated cost $50,000.

Distillery—Mayer Distillers, Newport, Ky., or c/o John Wathen Distillery, Lebanon, Ky., has purchased a site at Newport and contemplates the construction of a distillery. Estimated cost $150,000.

Distillery—Trenton Valley Distillers Corp., Trenton, Mich., is having plans prepared by G. F. Diehl, Archt., 120 Madison Ave., Detroit, Mich., for a 2 story, 75x100 ft. addition to its distillery. Estimated cost $25,000.

Factory—Attapulgas Clay Co., Attapulgas, Ga., plans to establish a factory at Jackson, Miss., for processing bentonite into filtering materials. Estimated cost $300,000.

Glass Factory—Owens-Illinois Pacific Coast Co., 1855 Folsom St., San Francisco, Calif., has acquired a site of 22 acres at Fruitvale Ave., Oakland, Calif., and will have plans prepared for a factory. P. D. Burtt, c/o Company, Engr.

Glass Factory—Shatterproof Glass Co., 151 South Waterman Ave., Detroit, Mich., contemplates reconstructing its factory recently destroyed by fire. Estimated cost to exceed $40,000.

Gypsum Plants—Universal Gypsum & Lime Co., 420 Lexington Ave., New York, N. Y., contemplates improving its plants at Clarence Center and Akron, N. Y.; Ft. Dodge, Ia., and York, Pa. Estimated cost $35,000 each.

Laboratory—Case School of Applied Science, W. E. Wickenden, Pres., Euclid Ave., and Wade Park, Cleveland, O., contemplates the construction of a 3 story chemistry laboratory and electric building. Estimated cost $2,500,000.

Laboratory—Institute of Paper Chemistry, Appleton, Wis., will soon award the contract for the construction of a 2 story, 40x115 ft., with 35x42 ft. wing, addition to its laboratory. Orbison & Orbison, Appleton, Archts.

Paint Factory—Ditzler Color Co., 8000 West Chicago Blvd., Detroit, Mich., is having plans prepared by Harley & Ellington, Archts. & Engrs., 1507 Stroh Bldg., Detroit, for the construction of a 2 story addition to its factory, also a 2 story office building. Estimated cost $30,000.

Pulp Mill—Sandview Pulp Co., Everett, Wash., plans to construct an addition to its pulp mill. Estimated cost $75,000.

Refinery—Lakeland Refinery Co., East Lansing, Mich., is having plans prepared by Miller Engineering Service, Chicago, Ill., for an oil refinery and distillate plant. Estimated cost $100,000.

Rubber Factory—Baldwin Rubber Co., 366 East South St., Pontiac, Mich., will soon award the contract for an addition to its factory. L. J. Keenan, 711 Peoples Bank Bldg., Pontiac, Archt. Estimated cost $30,000.

Silica Sand Plant—Michigan Silica Co., Flat Rock, Mich., is having plans prepared by Smith, Hinchman & Grylls, Engrs., Marquette Bldg., Detroit, Mich., for the construction of a silica sand refinery, including concrete and steel storage bins and buildings, screening plant, dryers, conveyors and crusher plant. Estimated cost $100,000.

Beet Sugar Refinery—Spreckels Sugar Co., 2 Pine St., San Francisco, Calif., plans the construction of a beet sugar refinery in Yolo County.

CONTRACTS AWARDED

Distillery—Bonnie Bros., Distillery, 34th and Bank Sts., Louisville, Ky., will build an addition to its distillery, including fermenter house, pumping equipment and drilling wells for water supply. Owner now awarding separate contracts for work. Estimated cost $40,000.

Distillery—Clyde Collins Chemical Co., West Memphis, Ark., will build a gin and apple jack distillery. Separate contracts have been awarded for work. Estimated cost including equipment exceeds $28,000.

Factory—Acheson Graphite Corp., Buffalo Ave., Niagara Falls, N. Y., awarded general contract for furnace building to Walter S. Johnson Building Co., 2532 Hyde Park Blvd., Niagara Falls; structural steel contract to McClintic-Marshall Corp., Bell and Abby Sts., Buffalo. Estimated cost $80,000.

Graphite Factory — Acheson Graphite Co., Buffalo Ave., Niagara Falls, N. Y., awarded contract for alterations and additions to Buildings No. 17 and 18, to Walter S. Johnson Bldg. Co., 3532 Hyde Park Blvd., Niagara Falls. Estimated cost $28,500.

Lacquer Factory—The Atlantic Lacquer Manufacturing Co., 691 Main St., Belleville, N. J., will alter its plant at Irvington, N. J., and install equipment. Separate contracts have been awarded for the work. $28,000.

Factory—General Aniline Works, Inc., Riverside Ave., Rensselaer, N. Y., awarded general contract for factory to W. G. Sheehan Construction Co., Inc., 28 DeWitt St., Albany. Estimated cost $100,000.

Factory—Krebs Color & Pigment Co., 2001 Benhill Ave., Baltimore, Md., will construct a weighing house and weighing tank, also a storage tank and pipe line. Work will be done by owners. Estimated cost $30,000.

Factory—New Jersey Zinc Co., Palmerton, N. J., will construct plant and furnace buildings here. Separate contracts are now being awarded. Estimated cost $40,000.

Factory—Superior Ceramic Corp., 314 West 13th St., Anderson, Ind., awarded contract 1 story, 70x370 ft. factory, 1 story, 40x70 ft. clay bin and 1 story, 30x30 ft. office building at Fairview Ave. and Big Four R. R., for the production of tile, pottery and dishes, to David Eshelman & Son, P. O. Box 937, Anderson, $37,763.

Factory—Universal Gypsum & Lime Co., National City, Mich., will improve its factory here. Work will be done by day labor and separate contracts.

Factory—Universal Gypsum & Lime Co., Rotan, Tex., will improve its factory here. Work will be done by day labor and separate contracts.

Laboratory—Northville Laboratories, Northville, Mich., will construct a plant and laboratory here. Work will be done by separate contracts. Estimated cost exceeds $28,000.

Lubricants Plant—Pennzoil Co., 155 West Washington Blvd., Los Angeles, Calif., awarded contract for new lubricants compounding and storage plant at proposed new plant at East 26th St. and Downey Rd., Vernon, Calif., to Stanton-Reed Co., 816 West 5th St., Los Angeles. Estimated cost $80,000. Total estimated cost of new plant which will include grease plant, power plant, laboratory and main warehouse $200,000.

Paper Factory—A. P. W. Paper Co., 1273 Bway., Albany, N. Y., awarded contract for factory at West Albany plant to J. P. Sewell, 1372 Hudson Ave., Albany. Estimated cost $500,000.

Refinery—Sweet Oil Refining Co., M. Pray, Pres., Wyman, Mich., awarded contract for constructing 1,200 bbl. distillation unit at crude oil refinery to Roy J. Miller Petroleum Engineers, Chicago, Ill., also c/o Owner.

Sugar Refinery—Fellsmere Sugar Co., Fellsmere, Fla., will construct a sugar refinery. Separate contracts have been awarded for the work. Estimated cost $50,000.

Tannery—Julius Freiberg Realty Co., c/o Wolfstein Tannery, lessee, Dunlop St., Cincinnati, O., awarded contract for altering and constructing extensions to tannery, to M. Marcus Building Co., 2109 Reading St., Cincinnati.

Steel Tanks—Shell Petroleum Corp., 1221 Locust St., St. Louis, Mo., awarded contract bubble tower for gasoline refinery, consisting of one steel tank, 11x76 ft., weighing 200,000 lb., together with necessary auxiliary piping, one 6½x20 ft. and one 11x40 ft., to Heine Boiler Co., 5319 Shreve Ave., St. Louis, Mo.

Mining Industry Increases Reagent Consumption

DECLINE in the mining of high-grade smelting ores in recent years has resulted in a gradual increase in the percentage of total output treated in concentration plants. This situation would be conducive to an expanding consumption of chemicals in mining operations if mining operations themselves had been maintained. Statistics, however, indicate that production of non-ferrous ore in this country started on a downward trend in 1930.

A report recently published by the Bureau of Mines states that total production of non-ferrous ore in 1933 was 24,712,694 tons, a decrease of 6 per cent from the 26,321,679 tons produced in 1932. In 1931 production was reported at 54,764,842 tons and in 1930 at 76,725,000 tons. This means that the 1933 output was less than one-third that of the 1930 total. In 1934 and in the present year to date there has been a notable improvement in the mining field in general and the use of chemicals in that direction undoubtedly has been tending upward in the last two years.

The accompanying tables give the reagent consumption for all ores in 1933 with the per ton consumption in 1932. A five-year comparison of reagent consumption also is included. The five-year figures accurately place the annual declines in consumption from 1929 to 1933 inclusive and likewise prove that up to 1933 the trend was upward for reagent consumption per ton of ore treated. The marked increase in consumption of sulphuric acid in 1933 was due to the operation in that year of mills treating copper-iron ores which were idle in 1932.

There were decreases in 1933 in the output of copper ore, lead ore, and copper-lead ore, but substantial gains in production of zinc ore, lead-zinc ore, and gold and silver ore. Of the total ore produced, 78.82 per cent, 19,478,258 tons was treated by concentration, 4.96 per cent was shipped direct to smelters, 12.95 per cent was treated at gold and silver mills, and the remainder, 3.27 per cent was treated at miscellaneous plants including copper leaching plants, magnetic concentration plants, and a slag fuming plant. Nearly all the ore concentrated by wet methods was treated at plants using flotation equipment.

Of the collecting agents, distillation products reversed the trend which had previously been in effect, namely toward greater use of synthetic products. Petroleum products were especially noteworthy among distillation collectors for their higher relative consumption. Xanthates recorded gains in use with the largest improvement claimed for amyl xanthates. Alkali consumption made gains with a loss in soda ash more than offset by larger use of caustic soda and lime both in actual quantity in the amount used per ton of ore.

Sodium sulphide and copper sulphate were used more widely in 1933 with the increase due partly to the increased output of lead-zinc ores and partly to the higher per ton use in the treatment of those ores.

Consumption of reagents in the treatment of all ores in 1933

[142 plants treating 12,968,228 tons of ore]

Reagent	Plants using	Ore treated (tons)	Consumption of reagents (pounds) Total, 1933	Per ton 1933	Per ton 1932
I. Frothers:					
Pine oils	110	7,647,672	745,954	0.098	0.105
Cresylic acid	61	7,430,534	1,023,568	.138	.165
Total frothers	142	12,968,228	1,769,522	.136	.147
II. Collectors:					
Distillation products:					
Coal-tar creosotes	29	3,891,938	641,937	.165	.190
Wood-tar creosotes	4	346,401	23,613	.068	.036
Petroleum products	3	8,271	1,968	.238	.001
Blast-furnace oils	2	603,490	91,463	.152	.122
Water-gas tars	1	15,195	960	.063	.....
Total distillation products	36	4,171,488	759,941	.182	.117
Synthetic products:					
Ethyl xanthates	88	5,648,288	597,305	.106	.085
Butyl xanthates	10	1,791,615	156,415	.087	.086
Amyl xanthates	45	1,206,691	118,422	.098	.035
Xanthate derivatives	3	312,446	31,345	.100	.011
Dicresol-dithiophosphoric acid	43	3,039,512	157,318	.052	.043
Sodium dicresol-dithiophosphate	25	3,534,003	124,382	.035	.044
Sodium diethyl-dithiophosphate	1	1,873,510	26,604	.014	.013
Thiocarbanilide	1	58,540	2,600	.044	.091
Total synthetic products	140	12,826,476	1,214,391	.095	.085
Total collectors	142	12,968,228	1,974,332	.152	.115
III. Acids and alkalies:					
Acids: Sulphuric acid	3	232,279	2,168,650	9.336	.072
Alkalies:					
Sodium carbonate	31	1,312,145	500,450	.381	.559
Sodium hydroxide	3	132,780	81,170	.611	.391
Lime	37	9,095,441	35,177,434	3.868	3.512
Total alkalies	61	9,649,778	35,759,054	3.706	3.462
IV. Other inorganic reagents:					
Sulphidising: Sodium sulphide	14	541,544	309,178	.571	.187
Activating: Copper sulphate	57	3,259,596	2,892,878	.887	.674
Depressing:					
Cyanides	23	6,634,574	388,294	.059	.033
Sodium sulphite	5	367,369	289,770	.789	1.092
Sodium silicate	6	616,535	192,806	.313	.310
Zinc sulphate	21	2,598,046	983,505	.379	.374
Sodium bichromate	2	248,540	9,990	.040	.206
Total depressing	35	7,228,719	1,864,365	.258	.217
Miscellaneous[1]	4	200,506	151,989	.758	.900
Total reagents	142	12,968,228	46,889,968	3.616	3.399

[1]Includes zinc chloride, calcium sulphate, starch, chlorine, and lead acetate.

Comparison of consumption of reagents, 1929-33

		1929	1930	1931	1932	1933
Ore treated	thousands of tons	65,405	47,259	35,956	16,124	12,968
Reagent consumption:						
Frothers	thousands of pounds	9,283	7,106	5,508	2,377	1,770
Collectors:						
Distillation	do	2,345	1,107	753	499	760
Synthetic	do	5,925	5,018	3,543	1,355	1,214
Acids	do	12,099	12,060	11,143	1,202	2,169
Alkalies	do	234,598	154,424	115,744	45,269	35,759
Sulphidising	do	2,589	1,226	643	444	309
Activating	do	6,723	5,390	3,325	2,067	2,893
Depressing	do	6,050	4,393	2,409	1,585	2,016
Total reagents	do	279,612	190,724	143,068	54,798	46,890
Reagent consumption:						
Frothers	pounds per ton of ore treated	0.144	0.152	0.153	0.147	0.136
Collectors:						
Distillation	do	.124	.106	.126	.117	.182
Synthetic	do	.091	.107	.100	.085	.095
Acids	do	22.030	24.933	21.342	.072	9.336
Alkalies	do	3.735	3.560	3.852	3.462	3.706
Sulphidising	do	.713	.154	.723	.187	.571
Activating	do	.627	.697	.593	.674	.887
Depressing	do	.213	.239	.174	.230	.271
Total reagents	do	4.275	4.036	3.979	3.399	3.616